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WALKER (J. C.), SCHROEDER (W. T.), & KUNTZ (J. E.). **Borax sprayed on Beets controls black spot.**—Reprinted from *Bett. Crops, 1944*, 4 pp., 3 figs., 1944. [Received September, 1946.]

In 1942, most of the fields planted with garden beets in eastern Racine and Kenosha counties, south-eastern Wisconsin, showed varying amounts of black spot [*R.A.M.*, xxv, pp. 380, 430] although borax had been applied at a rate of 50 lb. or more per acre before sowing. It is during or after the usual local mid-season droughts that boron deficiency becomes acute. In trials of mid-season spraying (in addition to the spring treatment) the unsprayed controls in the first experimental field, planted with Asgrow Canner, showed 37 to 43 per cent. black spot with 14 to 23 per cent. severe. Those given sprays containing 10 and 20 lb. borax per acre on 8th July and 7th August showed 6 per cent. or less severely affected plants. A single treatment of 20 lb. per acre on 7th August had no appreciable effect. In the second field, planted with Detroit Dark Red, where the percentage of affected plants was much lower in the unsprayed plots, a single application of 20 lb. per acre on the first date was highly effective, reducing the percentage of severely affected plants to under 0·4.

These results demonstrate that while a heavy spring application of borax is not a guarantee against heavy losses from black spot, a supplementary mid-season spray when applied at the proper time can reduce the condition to negligible proportions. It is hoped to carry out further work later.

WALKER (J. C.) & HARE (W. W.). **Pea diseases in Wisconsin in 1942.**—*Res. Bull. Wis. agric. Exp. Sta.* 145, 32 pp., 9 figs., 6 graphs, 1 map, 1942. [Received September, 1946.]

In this survey during 1942 of pea diseases in Wisconsin, the leading State in the production of canning peas, over 40 per cent. of all fields examined showed infection from *Ascochyta* blight (*Mycosphaerella pinodes*, *A. pinodella*, and *A. pisi*) [*R.A.M.*, xxi, p. 438; xxii, p. 285], bacterial blight (*Bacterium pisi*) [ibid., vii, p. 214], and common root rot (*Aphanomyces euteiches*) [ibid., xxi, p. 60]; 25 per cent. from anthracnose (*Colletotrichum pisi*) [ibid., i, p. 282], *Septoria* blotch (*S. pisi*) [ibid., xxi, p. 238], downy mildew (*Peronospora viciae*) [ibid., xiv, p. 340], and mosaic and streak virus [ibid., xvii, p. 220; xx, p. 334] diseases; and 10 per cent. from near wilt (*Fusarium oxysporum* f. *pisi* race 2) [ibid., xix, p. 252]. Powdery mildew (*Erysiphe polygoni*) [ibid., xxv, p. 225], *Fusarium* root rot (*F. solani* f. *pisi*), *Rhizoctonia* root rot (*Corticium vagum*) [*C. solani*: ibid., iii, p. 439], and frost injury were of little consequence. *F. oxysporum* f. *pisi* race 1 was not recorded, its absence being attributed to the planting of wilt-resistant varieties. In experimental plots, however, where wilt-susceptible varieties were planted, they were practically eliminated by the parasite.

The over all loss in Wisconsin for 1942 in respect of root rot alone is roughly assessed at 10 per cent. but is probably higher if losses from secondary root infection in abandoned flooded fields are included. The combined effect of other major diseases may be estimated at another 10 per cent. A further loss, intangible but

almost equally important, is due to the inferior quality associated with severe disease incidence.

The alarming general increase in *Ascochyta* blight, anthracnose, bacterial blight, and mosaic and streak virus infections cannot be explained entirely as due to the cool, wet season. The survey showed the first three to have been widely disseminated through western-grown seed. Maximum efforts should be made by seed-growers to control seed-borne pathogens and the establishment of a pea certification system may be required. Rotational cropping is urged and the fact that 20 per cent. of the 1942 pea crop was grown on land cropped with peas the previous year is regarded as one of the contributory causes of increased disease. Finally, the importance of the selection of well-drained fields is emphasized as a means of minimizing damage from root rot.

Walker (J. C.) & Snyder (W. C.). **Pea wilts and root rots.**—*Bull. Wis. agric. Exp. Sta.* 424, 16 pp., 3 figs., 2 graphs, 1942.

In this revised edition of a bulletin first published in 1933 [*R.A.M.*, xii, p. 609] a list of varieties resistant to all strains of wilt (*Fusarium oxysporum* f. *pisi* race 1) [ibid., xxv, p. 247] is given. The varieties Horal and Roger's K are cited as offering some resistance to near wilt (*F. oxysporum* f. *pisi* race 2) [ibid., xxiv, p. 486 and preceding abstract]. A section is included on the relation between soil type and wilt and the spread of the organism in the soil.

Plant diseases. Certification of French Bean seed.—*Agric. Gaz. N.S.W.*, lvii, 8, pp. 420–422, 4 figs., 1946.

The French Bean Seed Certification Scheme introduced in New South Wales in 1943–4 [*R.A.M.*, xxiv, p. 172; xxv, p. 22] was continued in 1945–6, when some 1,200 acres were inspected and 222 acres passed for certification. Several hundred bushels of certified Brown Beauty and Hawkesbury Wonder seed should be available for growers.

Yu (T. F.). **Powdery mildew of Broad Bean caused by Erysiphe polygoni DC. in Yunnan, China.**—*Phytopathology*, xxxvi, 5, pp. 370–378, 1946.

Powdery mildew of broad bean (*Erysiphe polygoni*) is very prevalent in the south of Yunnan, where it attacks the leaves, petioles, stems, and pods, occasionally causing a certain amount of damage, though the disease is in general of no great economic importance. The relatively high air temperatures prevailing from March to May, when the monthly means reach or exceed 20° C., favour outbreaks of the mildew.

Contrary to the results obtained by other workers [*R.A.M.*, v, p. 5; xv, p. 659], the writer succeeded in the inoculation of peas with the broad bean mildew and vice versa, and accordingly concludes that in Yunnan both diseases are caused by the same physiologic race of the fungus, which he designates *E. polygoni* DC. f. *viciae pisi* n. f., differing from Hammarlund's f. sp. *viciae-sativae* [ibid., iv, p. 431] in its capacity to infect peas. A distinct race of the mildew occurs on *Lathyrus quinquenervius*.

E. polygoni f. *viciae pisi* may overwinter either in the conidial or perithecial stage on broad beans, peas, and wild species of *Vicia*, e.g., common vetch and *V. hirsuta*.

Croxall (H. E.). **Some factors influencing loss of Onion bulbs during storage.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 143–147, [?1946].

In experiments undertaken during the 1944 season, early lifting of onions before the tops had died (after which *Botrytis* infection is most likely) [*R.A.M.*, xxiv, p. 261; xxv, pp. 91, 199] resulted in markedly less loss in storage of bulbs of the varieties Bedfordshire Champion, Danver's Yellow Globe, Giant Zittau, Red

Wethersfield, Rousham Park Hero, and Up-to-Date, thus bearing out the previous findings. Bulb loss was much higher in Danver's Yellow Globe than in the others. Onions stored outside deteriorated more quickly after 12th February than those stored in a greenhouse. No effect on subsequent loss in storage accrued from dust-treatments with sulphur, 50 per cent. tetramethylthiuram-disulphide, and a proprietary compound containing trichlornitrobenzene.

Most of the storage loss was due to *Botrytis allii* and the major part of the remainder to *B. cinerea*.

Ogilvie (L.). **Downy mildew of Lettuce: further investigations on strains of Bremia lactucae occurring in England.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 147–150, 2 figs., [?1946].

Continuing his studies on downy mildew of lettuce (*Bremia lactucae*) [*R.A.M.*, xxiii, p. 470], the author describes further investigations of the two strains, now designated 1 and 2, collected from over 20 localities.

Strain 1, the specialized strain of *B. lactucae*, was isolated principally from outdoor lettuces. Seedlings of prickly lettuce (*Lactuca serriola*) proved susceptible to infection by sprayed spores but *L. virosa*, *L. muralis*, endive (Batavian and curled), chicory, groundsel (*Senecio vulgaris*), and sow-thistle (*Sonchus oleraceus*) were not infected. The following additional lettuce varieties are listed as susceptible to strain 1: Arctic King, Attractie, Blatchford's Giant, White Cos, Borough Wonder, Cheshunt Early Giant, Feltham King, Forcing Mildew Resistant (Watkins and Simpson), Webb's Wonderful, and Celtuce, while Finney's 27 and Grand Rapids are added to the resistant varieties.

Strain 2 was found mainly on indoor lettuces and was shown experimentally not to infect endive, chicory, groundsel, sow-thistle, or *L. muralis*, but *L. serriola* and *L. virosa* proved easily susceptible. All cultivated varieties tested so far have proved susceptible and no variety resistant to this strain is yet known in Great Britain.

The author reviews previous work [ibid., xii, p. 417; xix, p. 577] on strains of *B. lactucae*, including that of Erwin (*Bull. Ia agric. Exp. Sta.* 196, 1921), whose *B. lactucae* strain, found on *L. scariola* var. *integrata* (= *L. virosa*) and transmitted to three wild American species and 27 cultivated varieties, was apparently similar to strain 2 discussed here. *L. serriola* and *L. virosa*, with their ability to act as hosts of *B. lactucae*, are described as a menace in the vicinity of market-gardens. While strain 1 has been found only on the former, strain 2 attacks both *L. serriola* and *L. virosa* which, as biennial weeds, can carry the fungus over from one year to the next. A large colony of *L. serriola* severely infected with strain 1 of *B. lactucae* was discovered on the banks of the Avon near Bath. Plants have also been found on a bombed site in that city, and along railway cuttings near Taunton.

L. virosa, susceptible to strain 2, is nearly related to *L. serriola*, similarly distributed, and cultivated in connexion with the production of the medicinal drug '*lactucarium*'. *B. lactucae* has not been found occurring naturally on this species.

In considering the breeding of resistant varieties, it is observed that lettuce, *L. serriola*, and *L. virosa* are all included in the *Lactuca* group having nine chromosomes, and cultivated lettuces probably owe their origin to *L. serriola*. The three species readily intercross and it is suggested that, as in the United States, they might be employed for the breeding of mildew-resistant varieties in this country.

Baker (K. F.). **Observations on some Botrytis diseases in California.**—*Plant Dis. Reptr*, xxx, 5, pp. 145–155, 1946. [Mimeographed.]

Three field epiphytotics of *Botrytis cinerea* in southern California were conditioned, respectively, by heavy rainfall in the winter of 1940–1 coupled with the normal mild temperatures of the State; unusually low temperature, high humidity, and many cloudy days from May to August in 1944; and infection prior to planting

out in April, 1945. All observations made support the conclusion that this parasite requires high humidity or free moisture in order to become aggressive, and is favoured by temperatures considerably below 70° F. The facultative parasitic nature of *B. cinerea* suggests that temperatures too low to favour the host, but not low enough to reduce fungal growth considerably, that is, not below 41°, are optimal for pathogenicity.

One of the epiphytotics occurred on greenhouse-grown *Capsicum* [chilli pepper] seedlings (California Wonder Bell) at Vista and San Juan Capistrano in 1945. The onset of the disease is attributed to the plants being packed, after hardening out of doors for some weeks, in layers in wet Canadian peat for transport to the fields. Uniform lesions were formed 3 to 5 in. from the top of the root system, notwithstanding that the plants remained in the crates only two to three days and were stored in a cool shed [*R.A.M.*, x, p. 57].

Borzini (G.). **Sulle crittogame più dannose alle nostre coltivazioni di funghi 'prataioli' (Psalliota campestris L. e Psalliota arvensis Sch.).** [On the fungi most injurious to our cultivation of edible Mushrooms (*Psalliota campestris* L. and *Psalliota arvensis* Sch.).]—*Boll. Staz. Pat. veg. Roma*, N.S., xxii, 3–4, pp. 131–172, 1 pl., 5 figs., 1942. [Received June, 1946.]

After giving an interesting account of the chief fungal and bacterial diseases attacking *Psalliota campestris* and *P. arvensis* in different countries and of the organisms that contaminate the beds, the author briefly describes the diseases that affect these hosts in Italy. Hitherto, failure has generally been due in Italy to attacks by *Mycogone perniciosa* [*R.A.M.*, xxii, p. 160], *Verticillium malthousei* [ibid., xxv, p. 93], and *Pseudomonas tolaasi* [ibid., xxiii, p. 126], and to the contaminating moulds *Verticilliopsis infestans* (*Oospora fimicola*) [ibid., xix, p. 191], *Papulaspora byssina* [ibid., xvii, p. 93], and the so-called green moulds (*Chaetomium olivaceum*, *C. globosum*, *Myceliophthora lutea*, and *Penicillium*, *Aspergillus*, and *Trichoderma* spp.) [cf. ibid., xiv, pp. 345, 346 *et passim*], but better methods of cultivation have now improved the situation.

Symptoms attributed formerly to *Mycogone perniciosa* have been constantly found associated in Italy with *Verticillium malthousei*. The characters of the fungus closely agreed with those described for *V. malthousei* by Ware [ibid., xiii, p. 287]; the simple conidiophores measured 10 to 150 by 0·8 to 2·5μ, the branched conidiophores up to 750 by 1·5 to 3·5μ, and the conidia 2·5 to 14 by 1·5 to 3μ, while the spore masses were 5 to 18μ in diameter. Under Italian conditions, *V. malthousei* commonly occurs during the final stages of growth, but the damage caused is not serious and is reduced by improving the ventilation of the beds.

The commonest bacterium found is *Pseudomonas tolaasi*, but it occurs only when atmospheric humidity is excessive and ventilation inadequate. *O. fimicola* and *Papulaspora byssina* are present in almost every bed, but they form only isolated centres of infection and seldom affect production. Green moulds occur only occasionally, and no noteworthy attack by *Myceliophthora lutea* was observed. From time to time a species of *Apiotrichum* spreads in epidemic fashion when the mycelium is sown, but later infections are negligible. *Pleurotus mutilus* [ibid., xvi, p. 653] was observed occasionally.

The paper concludes with practical directions for the prevention of disease in mushroom beds.

Flanzy (M.), Raymond (M.), & Bouscary (Andrée). **Défense du vignoble contre l'Oïdium. Essais de 1944.** [Protection of vineyards against *Oidium*. Experiments in 1944.]—*Rev. Vitic., Paris*, xcii, 8, pp. 229–234; 9, pp. 262–267, 1946.

Since 1941, the losses caused in France by vine *Oidium* [*Uncinula necator*: see next abstract] have increased every year. In 1942 and 1943 the disease reduced the

harvest by one-tenth. In the department of Aude alone the losses averaged 3,000,000 hl. wine per annum, or half the average yield, while in the south of France as a whole the losses amount to at least 10,000,000 hl. wine per annum. If effective action is not promptly taken, the cultivation of the most susceptible varieties, such as Carignan, Muscat, and Chardonnay, will have to be discontinued.

Details are given of an experiment carried out in the vicinity of Narbonne in which powdered local sulphur ores, five commercial sulphur products, and sodium bisulphite were compared with pure sulphur in spraying and dusting tests [*R.A.M.*, xxv, p. 432].

The results obtained may be summarized briefly as follows. In a year which was remarkably hot and dry and in which mildew attack was heavy the spray products gave insufficient protection, though most of them were fungicidal to some extent. The Narbonne powdered ores, on the other hand, when containing a sufficient percentage of sulphur, proved themselves to be of high value. Even the raw powder, averaging only 10 per cent. pure sulphur, by itself gave satisfactory control. If sulphur is added up to 20 per cent., or veins are struck containing about 20 per cent. sulphur, the material will be as good as triturated sulphur. Control by means of pure sulphur can now be regarded as superseded.

In severe outbreaks, very effective control will be given by four applications of powdered ore enriched to 35 per cent. If only powdered ore with 20 per cent. sulphur is obtainable a supplementary application before or after flowering should be given. If only the crude powder is obtainable six treatments are necessary, four before flowering and two after. For mild infections, three applications should be given with powders containing 35 or 20 per cent. sulphur, or four with those containing 10 per cent.

In present circumstances, the important thing is to apply early and repeated treatments, to reduce the number of spray applications and increase the number of dustings, making the utmost use of the local powdered ores with a content of at least 10 per cent. pure sulphur.

VIDAL (J. L.). **Efficacité comparée du soufre pur et des minerais enrichis, contre l'Oïdium.** [Comparative effectiveness of pure sulphur and enriched sulphur ores against *Oidium*.]—*Rev. Vitic., Paris*, xcii, 7, pp. 205–206, 1946.

After referring to the conflicting views that exist in France on the relative merits for use against vine *Oidium* [*Uncinula necator*: see preceding abstract] of pure sulphurs (i.e., sublimated and triturated containing 98 or 99 per cent. sulphur) on the one hand and ores enriched by the addition of pure sulphur on the other [*R.A.M.*, xxv, p. 433], the author describes an experiment carried out at Bois-Charente in 1945 on a plot of the highly susceptible Colombard variety which had been severely affected in 1944. The results showed that infection percentages after treatment with yellow sulphur, sulphur ores, and colloidal sulphurs, respectively, were 18·79, 21·01, and 36·97. Thus, in this test the effectiveness of the sulphur ores was quite comparable with that of the pure sulphur.

ROSEAU (H.). **Les méfaits de l'Oïdium en 1941 dans le vignoble du littoral cherchellois.** [The damage caused by *Oidium* in 1941 in the vineyard of the Cherchel littoral.]—*Rev. Vitic., Paris*, xcii, 7, pp. 201–202, 1946.

During 1941, the grape harvest in the coastal region of Cherchel, Algeria, was reduced by about 60 per cent. as a result of drought and attack by *Oidium* [*Uncinula necator*]. The more important losses were caused by the fungus, and in some estates these reached 80 per cent. Normally three applications of sublimated sulphur are made, the minimum quantity applied during the season being 150 kg. per ha., though in some years this figure reaches 200 kg.

The first serious signs of infection were noted in the second fortnight in May, and in three or four days the vines were completely infected. This was due partly to mists in April and May, but much more to lack of sulphur, the entire amount for the season being only 48 kg. By the end of May, the only healthy vines were those that had received the two first applications, either of sublimated sulphur or black sulphur. In some cases, wettable sulphurs gave good results. The most resistant vines were Cot de Chéragas, Aramon, and Grenache, followed by Alicante-Bouschet and Grand Novi (moderately resistant) and then by Carignan and Cinsault.

The two early treatments were the most effective, the most economical, and the easiest to apply.

Morel (G.). **Essais de laboratoire sur le mildiou de la Vigne.** [Laboratory tests on Vine mildew.]—*Rev. Vitic., Paris*, xcii, 7, pp. 210–213, 4 figs., 1946.

Experiments are described in which the author maintained tissue cultures of vine inoculated with *Plasmopara viticola* [*R.A.M.*, xxv, p. 94]. The application of this method to the investigation of various problems is discussed. Preliminary greenhouse tests confirmed the efficacy of dinitro 2–6 sulphocyano 1–4 chlorobenzene and zinc dimethyldithiocarbamate against *P. viticola*, while two organic compounds, methyltrichloracetamide and chlorobenzene-methylol-chloracetamide were also found to be effective.

Verona (O.) & Mencarini (G.). **Sul 'rot bianco' della Vite.** [On 'white rot' of the Vine.]—*Ann. Fac. agr. Pisa*, N.S., iii, 18, pp. 73–101, 13 figs., 1 diag., 1940. [French, German, and English summaries. Received August, 1946.]

In this paper, the authors after briefly reviewing the history of earlier investigations into vine white rot (*Coniothyrium diplodiella*) [*R.A.M.*, xv, p. 200; xxiii, pp. 91, 206, *et passim*] and describing the symptoms of the disease and the conditions under which it develops, give a full account of their cultural, morphological, and physiological studies on the fungus. As regards its systematic position, Viala and Ravaz in 1879 stated that they had found (on vine branches kept in sterile sand) a perithecial form, *Charrinia diplodiella*, which they regarded as the perfect state. This was transferred by Berlese to *Metasphaeria*, but has not been observed since, even in three years' work by the writers. In these circumstances it is difficult to accept the conclusion of Viala and Ravaz. The paper concludes with brief recommendations for control, and there is a bibliography of 49 references.

Galles (P.). **Le court-noué dans la basse plaine narbonnaise.** [Court-noué in the lower plain of Narbonne.]—*Rev. Vitic., Paris*, xcii, 8, p. 227, 1946.

In support of the view that *Phylloxera* [*vastatrix f. radicicola*] is not alone responsible for vine court-noué [*R.A.M.*, xxv, p. 491] the author instances a plantation of ungrafted vines near Narbonne planted between 1880 and 1890 in the alluvial plain of the river Aude and subject every year to flooding from the canal in the vicinity. The planting was highly successful, but in 1900 court-noué was noted on 50 to 200 vines, and the disease continued to spread. In view of the annual floods the insect could not possibly be incriminated in this case [cf. ibid., xix, p. 67], and, in fact, it has never been observed locally.

The first signs of the disease appeared in badly drained patches after the flood water had subsided. The worst affected vines were invariably those most deeply planted. After destruction of the vines and replanting the disease reappeared two or three years later. Cuttings taken from affected branches and raised in the greenhouse in pots of soil from a locality where no vines were grown all gave vines with court-noué. The author concludes that affected plants must secrete certain toxins or that if there is a virus it affects not only the vine organs but also the soil in which the vine is planted.

Tarassevich (L. M.). **Determination of the isoelectric point of virus proteins by the staining technique.**—*C.R. Acad. Sci., U.S.S.R.*, N.S., xlvii, 9, pp. 666–668, 4 graphs, 1945.

Experiments are described designed to develop a staining technique for determining the isoelectric point of virus proteins, seeking to utilize for this purpose the dependence of staining on pH. A drop of a crystalline suspension in ammonium sulphate of the tobacco mosaic virus, purified by the method of Rizhkov and Gromyko [*R.A.M.*, xvii, p. 708], was placed on a slide, air-dried, fixed with 96° alcohol, stained with the buffer staining solution for five minutes, and washed with the buffer solution. The intensity of staining was estimated by a five-mark scale, and the results showed that the virus crystals stain readily with acid fuchsin at low pH values and with difficulty at high ones. For basic fuchsin the relations are reversed. From the average of the pH values corresponding to the minimum intensity of their staining by acid and by basic fuchsin is obtained the isoelectric point of the virus protein tested, which in this case was pH 3·8, compared with pH 3·3 as determined by precipitating the protein in the presence of salts. The corresponding figures for cucumber mosaic were pH 4·2 and 4·8, and for 'zakuklivanie' [pseudo-rosette] of oats [ibid., xxiv, p. 13], 5·4 and 5, respectively. The technique has therefore relatively low precision but is simple and speedy.

Stubbs (L. L.). **A simple hand duster for the application of abrasives and insecticidal dusts in plant virus transmission studies.**—*J. Aust. Inst. agric. Sci.*, xii, 1–2, pp. 53–54, 2 figs., 1946.

A hand duster has been constructed from an Erlenmeyer flask, capacity 250 ml., and a De Vilbiss atomizer bulb, and with this consistently good results have been secured during the past three years in applying carborundum to the leaves of test plants to facilitate the mechanical transfer of certain plant viruses. By this simple device much time is saved as compared with the salt-shaker recommended for the same purpose [*R.A.M.*, xv, p. 737].

It can also be used to apply a commercial 3 per cent. nicotine dust through the muslin tops of cylindrical celluloid cages used for covering plants after aphid transfers, thus enabling the dust to reach all parts of the plant and increasing the fumigatory effect of the nicotine. Moreover, the aphids are killed without injuring the test plants.

Smith (K. M.). **Virus diseases of farm and garden crops.**—111 pp., 15 pl., 13 figs., Worcester, Littlebury & Co., Ltd., [?1946]. 10*s*. 6*d*.

This interesting and useful work is primarily intended for practical agriculturists and horticulturists, but it is also hoped that it will prove acceptable to the student and be of value to the busy advisory officer. The first two chapters deal with the more elementary technique of plant-virus study and the rest of the book gives descriptions and illustrations of the common virus diseases of farm and garden crops (potato, sugar beet, and other root crops, pulse and pasture crops, vegetables, soft fruit and hops, ornamental plants, and some medicinal and weed plants), with information on their control. Each chapter is provided with a list of literature and figures are given of the insect vectors.

Conners (I. L.) & Saville (D. B. O.). **Twenty-fifth Annual Report of the Canadian Plant Disease Survey, 1945.**—xvii+126 pp., 1946. [Mimeographed.]

In the section on new or noteworthy diseases in this report [cf. *R.A.M.*, xxv, p. 60] it is stated that during 1945 stem [black] rust (*Puccinia graminis*) was virtually absent in fields of resistant wheat varieties in Manitoba, though the amount of infection on susceptible varieties in experimental plots indicated that

heavy losses would have been sustained if the local farmers had continued to grow the old varieties. Wheat leaf [brown] rust (*P. triticina*) was severe in most parts of Canada except in the dry areas of Alberta and western Saskatchewan; Regent and Renown were almost as severely affected as Thatcher, as a result, apparently, of the presence of races of *P. triticina* to which they are susceptible.

Oat crown rust (*P. coronata*) was very prevalent in Manitoba and appeared in epidemic form in many parts of Ontario, Quebec, and the Maritime Provinces. Erban and other varieties with a similar type of resistance showed widespread damage in sharp contrast to the resistance displayed by Erban in 1938, this failure being due to the increasing prevalence of races of crown rust to which these varieties are susceptible. Oat black rust was somewhat severe in Manitoba and eastern Saskatchewan and locally in some parts of eastern Canada. The Ajax variety, hitherto resistant, was severely affected over most of Manitoba, while Vanguard was more heavily attacked than before, this being due to an unprecedented prevalence of races to which these varieties are susceptible. The severity of black rust in parts of eastern Ontario led to the initiation of a campaign to eradicate barberry and buckthorn [*Rhamnus* spp.] locally.

Wheat take-all (*Ophiobolus graminis*) was common, and in some fields severe, in north-eastern Saskatchewan; in Manitoba, where it seldom occurs, a severe outbreak was recorded in one field. It appears to be increasing in winter wheat in southern Ontario, and was recorded for the first time at St. Anne de la Pocatière, Quebec.

Lucerne bacterial wilt (*Corynebacterium insidiosum*) [ibid., xxv, p. 101] has now spread to the northern seed-producing areas of Alberta, and was reported for the first time in Manitoba. Crown rot due to a low-temperature Basidiomycete [ibid., xxiii, p. 3] was noted for the first time in southern Saskatchewan, where it was found at Swift Current. Crown wart (*Urophlyctis alfalfae*) [ibid., xxiv, pp. 62, 452], a new lucerne disease in Canada, was observed in British Columbia and in two fields at Chilliwack.

A destructive fungus root rot of flax, due to *Phoma* (?) *exigua* [ibid., xxi, p. 531], was recorded for the first time.

Bacterial ring rot (*Corynebacterium sepedonicum*) [ibid., xxv, p. 316] is still one of the most important diseases of potatoes in Canada, though no longer a serious menace to the certified seed industry. Its occurrence in Prince Edward Island and British Columbia is confined to sporadic infections, and in Alberta it continues to diminish. Fewer cases were found also in Ontario, and of these, fewer were on farms where the disease had been present before. It reached epidemic proportions in Manitoba, however, where an organized campaign is required to bring it under control. From the increased number of infections found in Saskatchewan in 1945, an extended survey would appear to be necessary in this province. Potato pink rot (*Phytophthora erythroseptica*) [ibid., xxv, p. 8] has now been reported from Manitoba and Quebec. Evidence obtained indicated that the occurrence of leaf roll is correlated with the abundance and activity of the aphid population, whereas mosaic incidence depends in general on the degree of the initial freedom of the seed from the disease.

Halo blight (*Pseudomonas medicaginis* var. *phaseolicola*) and other bacterial blights of beans [*Phaseolus* spp.] are on the increase. Beet downy mildew (*Peronospora schachtii*) was reported from the British Columbia interior. Wilt due to *Fusarium oxysporum* [? *F. bulbigenum* var. *niveum* f. 2: ibid., xxiv, p. 351] was very destructive in important melon-growing areas in Ontario. Onion yellow dwarf [ibid., xxiv, p. 133], a disease new to Canada, was found in British Columbia. Observations in Ontario indicated that black pod blotch due to *Alternaria raphani* [ibid., xxv, p. 204] can be a destructive disease of the radish seed crop. A strain of *Cladosporium fulvum* attacking Vetomold 121 tomatoes appeared in south-western

Ontario. Apple scab (*Venturia inaequalis*) was exceptionally severe from Ontario eastwards, defoliation and crop loss being common in inadequately sprayed orchards. What is suspected to be pear stony pit [ibid., xxiv, pp. 22, 402] was found in Ontario, the first record in eastern Canada. Gooseberry downy mildew (*Plasmopara ribicola*) [ibid., x, p. 42] occurred in Ontario, this being the first record for Canada. Strawberry red core (*Phytophthora fragariae*) [ibid., xxiv, pp. 128, 325], recently found for the first time in British Columbia, caused heavy losses in the Fraser Valley. Dutch elm disease (*Ceratostomella ulmi*) [ibid., xxv, p. 61] is more widespread in Quebec than was indicated by the preliminary survey in 1944.

Other new or interesting records include *Dahlia* [tomato] spotted wilt in Manitoba and Quebec, *Pseudomonas syringae* on lilac in Alberta and Manitoba, and *Botrytis tulipae* on tulip at Ottawa.

Nómina de determinaciones de enfermedades de origen parasitario efectuadas durante el año 1945 por la Sección Fitopatología del Departamento de Sanidad vegetal, que no han sido mencionadas anteriormente para nuestro país. [List of determinations of diseases of parasitic origin made during the year 1945 by the Phytopathology Section of the Department of Plant Health, which have not been reported previously for our country.]—*Agric. tec., Chile*, v, 2, p. 224, 1945.

Included in this list of new records for the parasitic mycoflora of Chile determined in 1945 [cf. *R.A.M.*, xxv, p. 280] are *Myxosporium corticola* [ibid., xxiii, p. 476] on pear, *Penicillium expansum* on apple, *Ramularia cynarae* on globe artichoke (*Cynara scolymus*) [ibid., xxiv, p. 387], and *Septoria ribis* [*Mycosphaerella grossulariae*] on blackberry (*Rubus ulmifolius*).

Rybak (B.). **Actions bactériostatiques chez Pelargonium zonale et crown gall.** [Bacteriostatic effects of *Pelargonium zonale* and crown gall.]—*C.R. Acad. Sci., Paris*, ccxxiii, 16, pp. 586–587, 1946.

G. Amoureux (Thesis, Paris, 1934) reported the inhibition of growth of the hop and *Chrysanthemum* [*frutescens*] strains of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xxv, p. 386] by the admixture with the agar medium of an aqueous extract of *Pelargonium zonale*. The last-named plant contains appreciable quantities of phenolic compounds, the fungicidal effects of which have repeatedly been observed.

The author placed fragments, 20 mm. in length, of young *P. zonale* stems in tubes of nutrient agar, which were then inoculated with one or other of the above-mentioned strains of *Bact. tumefaciens* and incubated at 29° C. The growth of the organism was definitely inhibited, at a maximum distance of 4 to 5 mm. from the stem fragments, after 48 hours, and no appreciable diminution of the bacteriostatic effect followed an hour's exposure of the plant material to a temperature of 55°. It would appear from these tests that the phenolic components of plants may contribute, in a modest degree only, to their resistance to crown gall.

Ekstrand (H.). **Höstsädens och vallarnas övervintring 1945–46.** [The over-wintering of autumn cereals and grasses 1945–46.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 3, pp. 44–46, 1946.

Snow mould of cereals [*Calonectria graminicola*: *R.A.M.*, xxv, p. 496 and next abstract], though widespread in Sweden during the winter of 1945–6, did not materially reduce crop yields except in a few districts where the snow cover was particularly heavy.

Typhula itoana was present in a number of places on barley, wheat, rye, and various pasture grasses, but did not in general cause appreciable damage. *T. borealis*, often combined with *C. graminicola*, was troublesome in regions of heavy

snowfall, in one of which the two pathogens were jointly responsible for a 60 to 70 per cent. decrease in a wheat rotation.

The depredations of *Sclerotinia borealis* on rye and grasses increased in severity and extent with the approach to the Arctic Circle, where the timothy [*Phleum pratense*] crops, for instance, were largely or wholly decimated.

Clover was widely attacked by *S. trifoliorum*, usually in a mild form, and in the far north also by *T. borealis*.

Ekstrand (H.). **Förekomsten av utvintringssvampar pa höstsäd och vallväxter i Finland.** [Occurrence of fungi causing winter injury to autumn cereals and pasture crops in Finland.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 4, pp. 49–55, 1946.

In view of the prevalence and severity of *Sclerotinia borealis* on autumn-sown cereals and among pasture crops in northern Sweden [see preceding abstract] and its presence in the U.S.S.R. as far south as Leningrad (or farther in the interior of the country), it was of interest to determine the exact distribution of the pathogen in Finland, through which a trip was accordingly made for the purpose in the spring of 1946. At Tervola, on the river Kemi, the fungus was responsible for a reduction of 20 per cent. in a number of rye fields, while in the same district some pasture crops, especially first-year stands, sustained heavy damage. Rye and grasses also suffered extensively from *S. borealis* at Apukka, just north of the Arctic Circle, and at Tohmajärvi, quite near the new Russo-Finnish frontier. At Maarinka the fungus caused a loss of about 20 per cent. in Viatka rye on marshy ground, while some of the timothy [*Phleum pratense*] crops were reduced by 50 per cent. at least.

The distribution of *Typhula borealis* [loc. cit.] was largely co-extensive with that of *S. borealis*, but in general the former species was of little importance. The snow mould (*Fusarium*) [*nivale*: *Calonectria graminicola*] was also a frequent and injurious concomitant of *S. borealis*.

In a varietal experiment at Apukka, Greus, a 'land' rye from the vicinity of Uleåborg, proved to be the most resistant, producing a stand of 95 to 100 per cent., while the corresponding figures for Ensi, Toivo, Oiva, and Onni were 75, 40 to 50, 20 to 25, and 20 per cent., respectively.

In a fertilizer trial with rye on marshy ground at Tohmajärvi, 60 to 70 per cent. of the stand in the plots receiving no amendments was lost through the attacks of *S. borealis*, *T. borealis*, and *C. graminicola*, whereas in those given potash, phosphorus, and nitrogen, singly or combined, the reduction did not exceed a maximum of 10 to 20 per cent. The inclusion of nitrogen in the fertilizer did not appear to enhance the beneficial effects of the phosphorus and potash, which were presumably responsible for the superior resistance of the treated stands. The infection of *P. pratense*, following rye, by *S. borealis* and *T. borealis* was also reduced by soil treatments with phosphorus and potash.

Clover rot (*S. trifoliorum*) was not, in general, excessively severe in the districts visited. At the Ylistaro Experiment Station it occurred in a very erratic form, sparing the first year's crop but causing heavy depredations in the second (15 to 20 per cent.) and especially in the third (75 to 80).

Gottlieb (D.) & Garner (J. M.). **Rust and phosphorus distribution in Wheat leaves.**—*Phytopathology*, xxxvi, 7, pp. 557–564, 1 fig., 1946.

No consistent differences in the total radio-phosphorus content were found between healthy specimens of entire Little Club wheat leaves and those inoculated with *Puccinia graminis* race 34 at the Delaware Agricultural Experiment Station [*R.A.M.*, xxv, p. 272]. In inoculated leaves the differences in radio-phosphorus content between the infected distal and the uninfected basal portion were much

greater than the differences between comparable areas in sound plants. The distal parts always contained more radio-phosphorus, the average differences (in counts of radio-activity per gm. dry weight) between them and the basal in inoculated and uninoculated leaves being 4,667 and 1,967, respectively. The radio-phosphorus was shown by radiographs and photographs to be accumulated in the rusted parts of the leaves and concentrated in the parasitized areas. The specific activity of phosphorus in the uredospores was lower than in whole uninoculated or rusted leaves (17,200, 20,400, and 21,067 counts per gm., respectively).

RAPIN (J.). **Essais de lutte contre la carie du Froment (Tilletia tritici).** [Control tests against Wheat bunt (*Tilletia tritici*).]—*Rev. romande Agric., etc., 1946*, 8, pp. 65–66, 1946.

In tests carried out at Lausanne in 1945–6, wheat seed-grain of different varieties and hybrids after preliminary treatment in water at 53° C. for ten minutes was inoculated with spores of *Tilletia tritici* [*T. caries*] and sown in December in soil of pH 7·3 in a greenhouse, the pots after germination being placed in the open until field planting in February. At maturity, Mont-Calme 405 B (Plantahof × Hybrid 245), Mont-Calme 245, Oerlikon (Rimpauer früher Bastard × Strickhof), Huron, Mont-Calme 404 (245 × Plantahof), Mont-Calme 410 B (CD × Huron), Précoce CD, Mont-Calme 405 A (Plantahof × 245), Mont-Calme 268, Mont-Calme 408 A (Plaine × Huron), Mont-Calme 410 A (CD × Huron), Oerlikon No. 13/16 (Plantahof × Tassilo), Oerlikon No. 56/96 (Trubilo × Plantahof), Mont-Calme 408/B (Plaine × Huron), Plaine, and Plantahof showed, respectively, 84, 78, 72, 70, 68, 63, 61, 60, 52, 49, 47, 46, 45, 30, 24, and 23 per cent. infection.

When Mont-Calme 268 seed was washed and inoculated as before, treated with various fungicides [cf. *R.A.M.*, xxv, p. 207], and similarly grown, the plants from seed treated with 1 per cent. copper sulphate, 1 per cent. Bordeaux mixture, 1 per cent. formaldehyde (each for 30 minutes), and the following dusts, each at 2 per cent., viz., precipitated copper carbonate, abavit, ceretan [ceresan: ibid., xxiii, p. 330], prosat, graminon, and zyma showed, respectively, 4, 13·3, 0, 9, 0·3, 0, 1, 3·3, and 1·3 per cent. infection compared with 0 and 47·3, respectively, in the uninoculated and inoculated controls. When inoculated wheat seed was grown in pots of soil at pH 8·3, 7·3, and 5, infection was, respectively, 16·7, 47·3, and 0·3 per cent. In a further experiment, spores collected in 1944 and 1945 gave, respectively, 47·3 and 51 per cent. infection.

MUNDKUR (B. B.). **Studies in Indian cereal smuts. VIII. Nomenclature of Indian smut fungi and probable modes of their transmission.**—*Indian J. agric. Sci.*, xv, 2, pp. 108–110, 1945.

A synoptic table is presented showing the common names of Indian cereal smuts, their scientific names according to the International Rules of Botanical Nomenclature, their designations in previous practice, and their modes of transmission.

ELLIOTT (CHARLOTTE) & JENKINS (MERLE T.). **Helminthosporium turcicum leaf blight of Corn.**—*Phytopathology*, xxxvi, 8, pp. 660–666, 1 fig., 1 graph, 1946.

The results are presented of field inoculation tests of maize, undertaken at Beltsville, Maryland, in 1944, for resistance to *Helminthosporium turcicum* following the severe epidemic of leaf blight in 1942 [*R.A.M.*, xxii, p. 474].

As a result of the 1944 field inoculations, infections even heavier than in the epidemic of 1942 were induced. About five acres of maize were inoculated twice a week from the end of June to the time when the plants came into tassel and the disease spread rapidly during August and September. Leaf-blight ratings of 200 inbred lines, 176 crosses, and 184 double crosses in 1942 and 1944 showed most of these to be susceptible and earlier strains to be more susceptible than late-maturing

ones. NC34 proved the most resistant; CI.23, K175, Ky114, Mo21A, T49B, T105B, K155, CI.15, CI.16, and T×206 showed traces only of infection. Usually, the resistance was transmitted to hybrid progeny.

VENKATARAYAN (S. V.). **Mosaic disease of Ragi (Eleusine coracana Gaertn.).**—*Curr. Sci.*, xv, 9, pp. 258–259, 1 fig., 1946.

Previous to the writer's observation of the extensive infection of *Eleusine coracana* by mosaic in several localities of Mysore State in June and July, 1946, there was apparently only one record of the disease on this host, namely, that of McRae from Madras in 1928 [*R.A.M.*, viii, p. 424]. The affected plants in Mysore were severely infested by *Aphis maidis*. Sorghum in the vicinity showed mosaic symptoms from which sugar-cane, however, was free. *E. coracana* is one of the grasses listed by K. M. Smith [ibid., xvii, p. 52] as bearing chlorotic foliar patterns resembling those of the maize streak virus, but the appearance of the author's specimens was more suggestive of mosaic.

BRIEGER (F. G.) & MOREIRA (S.). **Experiências de cavalos para Citrus. II.** [Experiments with rootstocks for Citrus. II.]—*Bragantia, S. Paulo*, v, 10, pp. 597–658, 6 figs., 3 diags., 1945. [English summary.]

This is a progress report, embodying observations made since 1942, on the grafting experiments which are being carried out in São Paulo, Brazil, to determine the most suitable rootstocks for the leading commercial citrus varieties grown in the State, viz., Baianinha and Pêra oranges and Marsh Seedless grapefruit. All combinations involving sour or bitter-sweet orange rootstocks showed definite signs of the 'tristeza' form of root rot [*R.A.M.*, xxv, p. 558 and next abstract] while the scions grafted on citron and ponderosa lemon (*Citrus limonia*) presented evidence of incompatibility.

SARAVIA (G.). **Algunos aspectos de sanidad vegetal en Brasil.** [Some aspects of plant health in Brazil.]—*Simiente, Santiago de Chile*, xvi, 1, pp. 47–50, 2 figs., 1946.

During a recent visit to Brazil the writer ascertained that the 'tristeza' form of citrus root rot [see preceding abstract] was responsible in the principal citrus-producing State of São Paulo alone for the death of over 4,000,000 plants in the last four years. So grave a view of the situation is taken by the Peruvian and Chilean governments that they have closed their frontiers to the importation of citrus plants, seed, and propagating material.

FAWCETT (H. S.). **Stubborn disease of Citrus, a virosis.**—*Phytopathology*, xxxvi, 8, pp. 675–677, 1946.

Experimental evidence is presented to show that the stubborn disease of Navel orange trees first described by Fawcett *et al.* in 1944 [*R.A.M.*, xxiii, p. 294] is of virus origin. Sweet orange trees, grafted in the seedling stage in March, 1939, with buds from trees with stubborn disease were top-worked with buds from a healthy Navel in May, 1943. By March, 1946, the growth from the Navel buds had not only developed the branch and leaf symptoms characteristic of stubborn disease, but some of the fruits showed the 'acorn' symptoms [loc. cit.]. Healthy buds from the same source inserted into healthy trees at the same time produced normal branches, leaves, and fruit. The symptoms on the diseased trees developed slowly. The author gives to the virus the name *Citrivir pertinaciae*.

KLOTZ (L. J.) & ZENTMYER (G. A.). **Fungicides for the control of brown rot of Citrus.**—*Calif. Citrogr.*, xxxi, 11, p. 430, 1946.

Among many fungicides tested in the endeavour to find a material that would protect citrus fruits against *Phytophthora citrophthora* without aggravating the

damage caused by subsequent fumigation with hydrogen cyanide as copper sprays do, the following were found worthy of further investigation: disodium ethylene bisdithrocarbamate [dithane] with zinc sulphate and lime, tetra-chloroquinone, zinc dimethyl dithiocarbamate [methasan], and 2, 3-dichloro naphthoquinone. The effectiveness of the copper-containing materials was evident throughout. An iron-copper spray was outstandingly good, but caused surface injury. Under field conditions, 1 lb. spergon per 100 gals. became relatively ineffective on lemons after a few weeks. Dithane showed promise. Zerlate [*R.A.M.*, xxv, p. 397] appears to be worthy of commercial trial where the danger of copper damage is important.

DASTUR (J. F.). **Notes on Corticium album Dast. and C. salmonicolor B. and Br.**—*Curr. Sci.*, xv, 7, pp. 192–193, 1946.

A re-examination of the type material of the fungus on citrus in India described (in English only) by the author as *Corticium album* (ante-dated by *C. album* Britz.) and tentatively referred by D. P. Rogers to *Pellicularia* [*R.A.M.*, xxii, p. 372] has led to the acceptance of this conclusion, and the species is accordingly renamed *P. alba* n.sp., with a Latin diagnosis.

A comparative study of the author's specimens of *C. salmonicolor* from citrus in India and those from *Hevea* rubber, citrus, and *Acacia arabica* in Herb. Crypt. Ind. Orient., New Delhi, demonstrated the complete identity of all the material. The substitution of the name *P. salmonicolor* (B. & Br.) n.comb. for *C. salmonicolor* B. & Br. is therefore proposed.

CHAPMAN (H. D.). **What we know, and don't know, about diagnosis of nutrient deficiencies and excesses of Citrus.**—*Calif. Citrogr.*, xxxi, 11, pp. 416–417, 1946.

The author succinctly reviews the data at present available on which it is possible to diagnose citrus nutritional disorders. Three tables are provided, one listing the specific yield, tree, and quality problems in which soil conditions and fertility may play a part, another setting out the factors other than nutrition that should be considered in evaluating citrus troubles, and the third presenting for each element the tests and types of information useful in diagnosing specific deficiencies and excesses.

THOROLD (C. A.). **A note on results from spectrographic analysis of Coffee material.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 177–178, 1946.

From an investigation of stems and beans by spectrographic analysis it is concluded that Elgon dieback of coffee [*R.A.M.*, xxiv, p. 368] cannot be attributed to a deficiency of any major or minor elements. In the stems, a large difference between susceptible and resistant varieties was recorded only in the case of zinc. Injections into trees with solutions containing zinc failed to confer improvement on disease resistance.

HALPERIN (L.). **Fenómenos a considerarse con respecto al agente etiológico de la 'mancha angular' del Algodonero en nuestro país. [Phytomonas malvacearum (E. F. Smith) Bergey.] Comunicación preliminar.** [Phenomena to be considered with regard to the etiological agent of 'angular spot' of Cotton in our country [*Phytomonas malvacearum* (E. F. Smith) Bergey]. Preliminary note.]—*Physis, B. Aires*, xv, 47, pp. 99–102, 1 fig., 1939. [Received September, 1946.]

Cultures of *Phytomonas* [*Xanthomonas*] *malvacearum* from cotton in Argentina differ in certain respects from the descriptions given by E. F. Smith and other bacteriologists. For instance, the colonies in the densely sown portions of nutrient agar plates are yellow, circular, smooth, and glistening; litmus milk is acidified; growth on potato slices is only moderate; nitrates in a synthetic nitrated medium

are reduced to nitrites; and a number of carbohydrates, including glucose, levulose, lactose, saccharose, maltose, sorbitol, mannitol, and mannose, are utilized with production of acid in each case.

BIRAGHI (A.). **Sulle 'Alternaria' del Cotone con particolare riguardo alla 'A. macrospora' Zimm.** [On the *Alternaria* species affecting Cotton, particularly with respect to *A. macrospora* Zimm.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxii, 3–4, pp. 181–192, 1 pl.; 4 figs., 1942. [Received June, 1946.]

During 1939 and 1940, the author observed diseased cotton leaves in Italy showing different forms of leaf symptoms. The simplest consisted of round, dark violaceous-red spots 1 to 2 mm. in diameter. Others were slightly larger, irregular, and had a central circular area of brown, dry tissue which often fell out. In more serious infections the spots were sometimes over 1 cm. in diameter and had a dry, white central area which did not usually become detached. In favourable environmental conditions the spots gradually enlarged, became confluent, and involved a large part of the leaf, the affected leaves finally becoming detached. The dead parts of the larger spots bore two distinct types of *Alternaria* conidia. The more mildly affected leaves, after being placed in a damp chamber, developed conidia with a long, hyaline beak, here identified as *A. macrospora.* Most of the conidia on the larger lesions resembled those of the *Alternaria* previously found by the author on the fibres of mummified cotton bolls [*R.A.M.*, xvii, p. 674] and having a short beak, but mixed with them were conidia of the longer-beaked type. Observations in two localities showed that in one the conidial measurements of the latter were: total length 86 to 166·5 μ, length of beak 38 to 101·8 μ, and diameter of conidia 14 to 19 μ, while in the other the corresponding figures were 132 to 187·5 μ, 62 to 109 μ, and 17 to 21·5 μ, respectively.

A careful comparison of the characters of these two types of *Alternaria* showed that the author's earlier view that the one found on the fibres of diseased cotton bolls belonged to *A. macrospora* must be discarded. The form with the long beak is unquestionably that species, while the one with the shorter beak, which is identical with that formerly found in the mummified bolls and with that referred by Hopkins in Rhodesia to *A. gossypina*, should be included, it is claimed, in *A. cheiranthi* sensu Wiltshire.

According to the author's observations, *A. macrospora* attacks cotton very frequently, but the seriousness of the lesions it produces on the leaves depends largely on humidity conditions. Generally, the fungus produces small, dark-red spots, but in very damp conditions it develops abundantly in the leaf tissues and causes a large part of the leaf surface to wither, after which the affected leaves fall off. In such cases, the injury to the tissues is aggravated by the other species, which becomes established subsequently and behaves as a saprophyte.

COUCH (J. N.). **Two species of Septobasidium from Mexico with unusual insect houses.**—*J. Elisha Mitchell sci. Soc.*, lxii, 1, pp. 87–94, 2 pl., 4 figs., 1946.

Full descriptions are given of the two new species of *Septobasidium*, *S. fraxini* and *S. soleare*, found by the author in Mexico during 1940 in symbiosis with scale insects on ash trees and a small deciduous tree, respectively.

VIENNOT-BOURGIN (G.). **Botrytis cinerea parasite des cultures de Lin en France. (Note préliminaire.)** [*Botrytis cinerea* parasitic on Flax crops in France. (Preliminary note).]—*Rev. Mycologie*, N.S., v, 2–3, pp. 55–63, 1 pl. (facing p. 86), 2 figs., 1940. [Received July, 1946.]

Flax grown near Lannion and Landivisiau, Brittany, from seed of certain new, white-flowered varieties (especially Hermine) imported from Friesland showed

bare patches up to 3 sq.m. in area, amounting in some fields to about one-quarter of the total surface sown. In these places most of the few plants that did come up were short and weak, and bore very short, unequal secondary branches. They were yellow and showed slate- or brownish-grey, oval, necrotic spots up to 1·5 cm. long in the middle and lower parts of the stems. From the surface of these lesions the author isolated a fungus agreeing with the description of *Botrytis cinerea* [*R.A.M.*, xix, p. 597; xxiii, pp. 17, 132] and which could also be referred to *B. cinerea* f. *lini* [ibid., ix, p. 246].

To ascertain whether the disease was seed-borne, the author germinated four lots of seed of different origin (including Hermine grown in Friesland) in sterile conditions. Percentage germination ranged from 96 to 98·5, but six days after the emergence of the shoot, the Hermine plants showed infection by *B. cinerea*, though the other varieties remained unaffected. When seed from the Hermine plants was shaken up in distilled water and some of the water placed in a culture tube, four days later the conidiophores of *B. cinerea* developed, with other species, including *Penicillium* and some Mucoraceae.

MILLINGTON (A. J.). **Wada, a rust-resistant Flax variety.**—*J. Aust. Inst. agric. Sci.*, xii, 1–2, pp. 50–51, 1946.

In this note recording the development of the rust[*Melampsora lini*]-resistant flax variety Wada it is stated that selected lines crossed with Concurrent have yielded strains which combine the resistance and early maturity of Wada with the greater strain strength and higher seed yield of the other parent. Resistance appears to be inherited in a simple manner and it is thought that the gene or genes concerned may be the same as those of Russian resistant varieties.

WILSIE (C. P.) & REDDY (C. S.). **Seed treatment experiments with Hemp.**—*J. Amer. Soc. Agron.*, xxxviii, 8, pp. 693–701, 1946.

A tabulated account is given of experiments in Iowa to determine the value of various hemp seed treatments as means of increasing the stands to cover the greatly extended acreage demanded by the war-emergency programme [*R.A.M.*, xxiii, p. 438]. In one greenhouse test on field soil heavily infected by [unspecified] plant pathogens, the application of spergon, arasan, and semesan jr. at the rate of 2 oz. per 50 lb. seed augmented the stand by 100 per cent. or more [cf. ibid., xxv, p. 501], while in another two spergon alone (1·5 or 3 oz.) and the same plus new improved ceresan (80 : 20) produced increases of 33 to 50 per cent. In three years' field trials early plantings (20th April to 1st May) of high-grade seed were not materially benefited by the treatments, but an improvement both in stand and straw yield was frequently observed in the later ones (10th May to 15th June). In a test with seed sown after a year's storage, new improved ceresan and arasan both increased stand but not yield in an early planting (20th April), while both were favourably affected in the later one of 30th May. Older seed did not respond to any of the treatments.

SMITH (O. F.). **Effect of soil temperature on the development of Rhizoctonia root canker of Alfalfa.**—*Phytopathology*, xxxvi, 8, pp. 638–642, 1 fig., 2 graphs, 1946.

The influence of soil temperature on the development of root canker of lucerne [*R.A.M.*, xxiii, p. 109] caused by *Rhizoctonia* [*Corticium*] *solani* is further demonstrated by the author, who shows that the optimum temperature for the growth of the pathogen both in culture and on the host is between 24° and 30° C. In the field very few cankers were observed at a soil temperature below 20° or above 35°

after 50 days. Few cankers developed at temperatures lower than 20° in the spring, and their development ceased in autumn after the soil temperature had dropped to about 20° or lower.

WEIMER (J. L.). **Lespedeza anthracnose.**—*Phytopathology*, xxxvi, 7, pp. 524–533, 3 figs., 1946.

An anthracnose of annual *Lespedeza* caused by a strain of *Glomerella cingulata* is described from the Georgia Agricultural Experiment Station. The leaflets of affected plants bear variable numbers of roughly circular, elliptical, or angular, brownish lesions, 1 to 5 mm. in diameter, of which a single one suffices to cause shedding. On the petioles and stems the dark brown to nearly black lesions are circular or linear: the stems of young seedlings may be completely girdled and the plants killed. The disease is favoured by the wet periods of late spring and early summer and tends to disappear during the subsequent dry weather. The strain of *G. cingulata* responsible for the infection of *Lespedeza* was shown to differ from the apple, lupin [*R.A.M.*, xxii, p. 299], and *Chamaecrista* [ibid., xxiv, p. 242] isolates by inoculation tests, in which only the first-named attacked its own host. In general, *L. striata* appears to be more susceptible to anthracnose than *L. stipulacea*, and control may be sought, if necessary, by the development of resistant varieties from strains such as F.C. 31249 of the latter species.

BERG (A.) & CLULO (GENEVIEVE). **The relation of manganese to internal bark necrosis of Apple.**—*Science*, civ, 2699, pp. 265–266, 1946.

After referring to the opinions of other workers that internal bark necrosis of apple trees is due to boron deficiency [*R.A.M.*, xvii, p. 400], the authors state that in six years' studies of this disorder in West Virginia they have failed to induce any of the bark symptoms by growing Red Delicious apple trees in boron-free sand cultures. Boron applications to affected trees in orchards did not correct the condition. Diseased tissues contained unusually high concentrations of both manganese and iron, and it was found, also, that the disorder was most prevalent on acid soils containing appreciable amounts of readily available manganese.

In June, 1943, 54 Red Delicious apple 'whips' were planted in crocks in soils A (from an affected orchard) and B (from an area where the disorder was not present). When established, some of the trees were given one application in each season of manganese (24 to 384 p.p.m. as manganese sulphate in solution) or iron (24 to 384 p.p.m. in the form of iron tartrate), or both. All the unaffected trees were placed in cold storage for the winter, and in April returned to the greenhouse. By the end of the third growing season (1945), of the trees in soil A, 90·7 per cent. of the treated and 58·3 per cent. of the untreated were affected, while in soil B, 54 per cent. of those treated were affected, and all the controls were healthy.

In April, 1945, a similar experiment was carried out with 144 trees using concentrations of from 96 to 1,536 p.p.m. of iron and manganese. By the end of the first season 75 per cent. of the treated trees and 45·4 per cent. of the controls in soil A had become affected, the corresponding figures for soil B being 31 and 0 per cent.

At the same time Red Delicious apple whips were grown in acid-washed sand cultures with the addition of manganese in concentrations ranging in geometric progression from 0·5 to 128 p.p.m. Within seven days the new leaves were showing signs of manganese toxicity which varied in intensity with the concentration used. At the end of the first growing season the disorder, in an exceptionally severe form, was apparent on the old and new wood of all four trees given the two highest concentrations of manganese, i.e., 64 and 128 p.p.m. The symptoms appeared at the same time in all trees grown in soil A whether in the greenhouse or in the orchard.

The addition of lime to eight crocks of soil A, decreasing the acidity from pH 4·2 to 6·5, successfully prevented the development of internal bark necrosis.

Hitz (C. W.) & Haut (I. C.). **Effects of waxing and pre-storage treatments upon prolonging the edible and storage qualities of Apples.**—*Tech. Bull. Md agric. Exp. Sta.* A14, 44 pp., 3 figs., 8 graphs, 1942. [Received September, 1946.]

Preliminary work at the Maryland Agricultural Experiment Station in 1936 having indicated the value of brytene 489A wax [*R.A.M.*, xxiv, p. 139] in prolonging the storage qualities of apples (*Proc. Amer. Soc. hort. Sci.*, xxxvi, pp. 470–478, 1939), a more comprehensive study of the effects of the treatment on Grimes Golden and Golden Delicious was undertaken from 1938 to 1940.

The wax, applied at the rate of one part to two parts of water, was highly effective in the reduction of weight loss and storage wilt, but it increased the severity of scald in Grimes Golden stored at 32° F. [*R.A.M.*, xxv, p. 507]. This drawback, however, could be mitigated or obviated by pre-ripening, involving a week's exposure to a temperature of 60° in a closed room, which likewise combated the disorder on unwaxed fruits. With progressive harvest dates there was a proportional reduction in scald corresponding to the greater maturity of the fruit.

Cash (Mary). **A contribution to a study of the physiology of decay in Apples.**—*Proc. Linn. Soc. N.S.W.*, lxx, 5–6, pp. 317–327, 15 graphs, 1946.

While these studies of the effect of environmental factors on the rate of decay in storage of Delicious and Granny Smith apples, due to the wound parasite, *Penicillium expansum*, and the 'bull's-eye rot' fungus, *Gloeosporium album* [*R.A.M.*, xviii, p. 743], suggest that the rate of radial advance of the rot depends on the stage of maturity, the district from which the fruit comes, and the variety, no adequate explanation was found for the differential decay observed between varieties. Inherent qualities of firmness of tissue and skin colour appeared to have no measurable influence on the rate of decay.

The rates of radial advance of *G. album* in apples were closely correlated with its growth in culture at different pH values [ibid., xxi, p. 384], which may possibly explain the differential rate of decay between varieties. So great, however, was the variation in the pH values of apples of the same maturity that differences in radial advance at different stages of maturity in the same variety could not be attributed to the hydrogen-ion factor.

Maximum development of *G. album* occurred at pH 4, the rate of growth falling progressively as the culture media became more acid. *P. expansum* growing on broth buffered by McIlvaine's standards was unaffected by pH, but using hydrochloric acid–potassium chloride buffers, optimal growth occurred at pH 3·6, which is nearly that of Granny Smith apple juice (3·5). Growth, however, was faster in fruit of the Delicious variety, yet in cultures of the same pH the growth rate was less.

The germination of the spores of *G. album* does not appear to be affected by temperature, but lower temperatures prolonged the dormant period of *P. expansum.* Spore age (up to 240 days) had no effect on the latent period or on the percentage germination of either fungus at different temperatures.

Ferguson (S. W.) & Holbeche (J. A.). **Boron deficiency in Pears. Symptoms and control measures.**—*Agric. Gaz. N.S.W.*, lvii, 5, pp. 241–243, 4 figs., 1946.

In the Kentucky area of New South Wales serious crop losses are caused in pears by boron deficiency [*R.A.M.*, xxiii, p. 334; xxv, p. 506], the symptoms of which are given, including varietal symptoms on fruits.

The control method recommended consists in making a soil application of borax at the rate of $\frac{1}{4}$ to 1 lb. per tree according to size (applications to small, non-bearing trees are not advised) in autumn, the borax being lightly chipped into the soil after

spreading. This should give effective control for three to five years at least, and no further dressing should be applied until the presence of cork is noted.

Sprays have also proved effective over a wide area, the concentrations used ranging from 1 to $2\frac{1}{2}$ lb. borax per 100 gals. water. This may be combined with lead arsenate and applied at the calyx stage or with lime-sulphur for the first cover spray. Spraying should be practised every year.

Brown (J. G.) & Heep (D. M.). **Effect of streptomycin on budwood infected with Phytomonas pruni.**—*Science*, civ, 2696, p. 208, 1946.

At the Arizona Agricultural Experiment Station streptomycin, both crude and crystalline, was successfully used in the elimination from plum budwood of infection by *Phytomonas* [*Xanthomonas*] *pruni* [*R.A.M.*, xxv, p. 564]. In its crude form the drug was isolated from a culture of *Streptomyces* [*Actinomyces*] *griseus* and the crystalline preparation was supplied by Schenley Laboratories, Inc. Pieces of branches $5\frac{1}{2}$ to $6\frac{1}{2}$ in. long, bearing lesions up to 1 in. long, some almost girdling the branch and penetrating to the stele, were placed in beakers either in an upright position, with the basal $1\frac{1}{2}$ in. in the streptomycin solution, or horizontally so that they were completely submerged. The beakers were then transferred to an enclosed chamber, subjected to negative pressure and maintained at a temperature of 22° to 25° C. The studies are still in progress, but it is already clear from cultural experiments that the application of crude streptomycin at a concentration of 6 to 8 Oxford units, or a concentrated dose of the crystalline preparation, acting overnight under the conditions described, resulted in perfectly clean budwood, which gave rise to healthy foliage, whereas the controls in distilled water yielded abundant growth of *X. pruni.*

Goidànich (G.). **Peach-tree decay in North Italy with phloem necrosis and degeneration of the cambium.**—*Int. Bull. Pl. Prot.*, xx, 5–6, pp. 33M–38M, 3 figs., 1946.

During the past seven or eight years peach trees growing in the Udine and Trieste Provinces of Venezia Giulia have shown a form of decay attended sometimes by a high rate of mortality. In one orchard, of some thousands of peach trees planted eight years before, and which in the spring of 1940 appeared to be in excellent condition, approximately 80 per cent. showed conspicuous symptoms during the summer and by the following spring 300 had died. In 1941 the disease had spread to almost all the healthy trees. A similar and equally serious condition was reported in 1940 from the area between Udine and Monfalcone on the Adriatic coast. The disease everywhere appeared to spread round the initial centres of the outbreak.

The leaves of the affected trees turned pale and showed red areas, particularly along the edges and veins. The edges rolled upwards and inwards, often with marked swelling. Vegetation was thin and concentrated near the top, rosette formations or witches' brooms developing at the extremity of each branch. During spring no pathological symptom appeared externally on the bark, but later on cracks and depressions appeared, accompanied by gum exudation. In an advanced stage the largest branches suddenly withered and the entire foliage might become affected before summer started. As a rule the trees died off during summer.

Internally, the median part of the phloem assumed a rust colour and later turned brown. This discoloration spread and in more advanced stages the entire thickness of the phloem was affected, the discoloration passing eventually into the wood. It was distinctly visible in one-year-old branches, but became arrested in the trunk at the graft level.

Profound degeneration of the cambium was present, and the phloem showed progressive swelling of the walls, followed by obliteration of the lumen, and succes-

sive gummosis. The changes in the woody tissues consisted mainly in a gummy degeneration of the associated tissues, but not the medullary rays.

No causal organism could be isolated and the symptoms were clearly not due to cold. The condition does, however, show marked similarity to non-parasitic leptonecrosis of fruit trees [*R.A.M.*, xiv, p. 320 *et passim*] and to various other non-parasitic disorders found in different parts of Europe, including nutritional rosette of peach [ibid., xxv, p. 265] and the withering of olives observed in Italy and Spain [ibid., xviii, p. 537; xxv, p. 172].

Blodgett (E. C.). **Transmission of Peach wart by graft inoculations with affected fruit tissue.**—*Phytopathology*, xxxvi, 8, p. 675, 1946.

In August, 1942, three J. H. Hale and three Elberta peach trees at Moscow, Idaho, were inoculated by inserting three wedges of fruit tissue affected with the peach wart virus [*R.A.M.*, xxv, p. 566] into the bark of each trunk [cf. ibid., xxiv, p. 155]. Examination in August, 1945, showed that all the trees inoculated by this method and by bud transmission were the only ones showing warty fruit in plots containing several hundred. The fruit symptoms were typical and severe [ibid., xxii, p. 213]. No control inoculations with healthy tissue were made.

Cochran (L. C.). **Passage of the ring spot virus through Mazzard Cherry seeds.**—*Science*, civ, 2699, pp. 269–270, 1946.

When buds from unbudded Mazzard cherry seedlings with leaves showing ring spot and mottled patterns [cf. *R.A.M.*, xxiv, p. 236] were inserted into peach trees, typical ring spot symptoms developed. This suggested seed passage of the virus. In 1943 seed was obtained from four sources, (*a*) mixed commercial Mazzard seed, (*b*) seed of Stark's Gold (a large-fruited yellow Mazzard) with no evidence of ring spot, (*c*) Mahaleb [*Prunus mahaleb*] seed from a tree experimentally infected with ring spot and which had shown characteristic symptoms for two years, and (*d*) seed from an apparently virus-free Mahaleb cherry. All the seeds were stored for 100 days in moist peat at 36° to 40° F. They were planted in ground beds in a lath house in April, 1944. By 1st June, of 467 seedlings of lot (*a*) 25 showed ring spot. No evidence of the disease was seen in seedlings of the other three lots and none appeared during the next year.

In October, 1944, two buds from each of six of the affected Mazzard seedlings were inserted in each of two Hale peach nursery trees. A parallel series was prepared with buds from apparently healthy seedlings of lot (*a*). In April, 1945, seven of the 12 inoculated peaches, representing five of the six symptom-bearing Mazzards, showed typical ring spot. None in the parallel series developed ring spot.

The evidence, therefore, indicates that the ring spot virus can invade and be carried in Mazzard cherry seeds.

Gherson (L.). **A disease of Fragaria caused by Fusarium orthoceras.**—*Palest. J. Bot.*, J. Ser., iii, 1, pp. 54–55, 1945.

In 1941 strawberry plants in a Jerusalem garden withered after rooting normally, and from white spots on the dried roots *Fusarium orthoceras* was isolated. Inoculations of the soil with suspensions of the isolate, or of the roots through wounds, induced the characteristic symptoms and the plants died in 70 days. The fungus was successfully reisolated. In culture it exhibited great morphological variability. The optimum temperature for growth was 24° C.; at 4° growth was checked and a temperature of 37° was lethal. The mycelium altered its colour according to the hydrogen-ion concentration of the medium, being ruby to yellow in acid media and dark blue-grey in basic.

Venkatakrishnaiya (N. S.). **Perfect stage of Sclerotium rolfsii Sacc. causing pseudo stem-rot of Plantain (Musa sapientum).**—*Curr. Sci.*, xv, 9, p. 259, 2 figs., 1946.

Plantains of the Rasabale variety in Mysore, Bangalore, and Tunkur Districts, Mysore State, are subject to a rot caused by *Sclerotium rolfsii*, which was cultured from diseased garden fruits in August, 1935, and produced basidiospores on onion-asparagin agar in 40 days [cf. *R.A.M.*, xviii, p. 233]. Both test-tube and Petri-dish cultures, grown at 17·9° to 29·1° C. and stored for 40 to 60 days, developed a dense, white hymenium in July, 1936. The clavate, hyaline basidia, closely aggregated into crusts, measure 6 to 12 by 4 to 6 μ (average of 14, 9 by 4·5 μ) and bear two to four sterigmata, 4 μ in length; the smooth, hyaline, ovate basidiospores are 3 to 4 by 2 to 3 μ. The perfect state of the fungus had previously been produced by Mundkur in India from cotton, betel vine [*Piper betle*], potato, and sugar-cane, and provisionally designated *Corticium rolfsii* Curzi [ibid., xiv, p. 125; and cf. xxii, p. 154.] The dimensions of the plantain strain and the appearance of the hymenial crust agree sufficiently well with the foregoing to identify it as the same species.

Sen (P. K.), Ganguly (B. D.), & Mallik (P. C.). **A note on a leaf-curl disease of the Papaya (Carica papaya Linn.).**—*Indian J. Hort.*, iii, 1, pp. 38–40, 2 pl., 1946.

Papaw trees in Bihar are affected by a serious disease causing, successively, foliar etiolation and curl, distortion of the leaves and fruits, and premature death. A similar trouble has been reported from Australia [under the name of 'yellow crinkle': *R.A.M.*, xvii, p. 259] and Hawaii [ibid., xviii, p. 693], in both of which a virus is suspected [cf. also ibid., xxii, p. 319]. Experiments conducted at the Horticultural Research Station, Sabour, to determine the nature of the disease, showed that the leaf-curl symptoms could be induced in actively growing, sound plants of the Ranchi variety by inoculation with the juice from diseased specimens; that the disease is not seed-borne; and that it can be initiated by waterlogging of the soil, independent of inoculation. Further investigations are proceeding.

Barratt (R. W.). **A laboratory assay for stability of organic fungicide residues.**—Abs. in *Phytopathology*, xxxvi, 8, p. 679, 1946.

A technique is described for measuring the following factors causing failure of fungicides in the field: tenacity, previous material in the spray tank or additives, decomposition during application, and of the spray residue by ultra-violet light, leaf exudates, atmospheric gases, rain water, and soil on leaves. Two sets of coated glass slides are sprayed in a dosage series employing a dose ratio of 2 or $\sqrt{2}$, one set being assayed immediately for fungicidal potency. The remaining slides are stored at a constant temperature in a closed chamber, having the environment being studied. By assaying slides stored for different periods the LD_{90} values in terms of microgm. per sq. in. can be determined. Studies of the rate of decomposition of disodium ethylene bisdithiocarbamate [commonly known as dithane] in the presence of water and oxygen have been made in this way, the rate being slowed down by adding zinc sulphate and lime.

Horsfall (J. G.), Barratt (R. W.), & Gries (A.). **Distinguishing permeation from toxicity of fungicides.**—Abs. in *Phytopathology*, xxxvi, 8, p. 680, 1946.

Penetration of a chemical into a cell is not usually distinguished in toxicity data from damage to the cell contents. Sodium sulphate and other monovalent electrolytes which increase the permeability of cells have been found to increase the potency of disodium ethylene bisdithiocarbamate [dithane] and *o*-quinone dioxime

to *Macrosporium* [*Stemphylium*] *sarciniforme*. That this is due to increased permeability and not to enhanced toxicity is demonstrated by the fact that the effect can be counteracted by calcium and other divalent electrolytes which reduce the permeability effects of sodium salts. If the toxicant is held constant and sodium sulphate is increased, potency increases and diminishes periodically, but these variations can be rectified by concomitant variation of the amount of calcium. If the effect is due to variations in permeation through a colloidal gel, in this case the cell wall of the spore, the periodic characteristic resembles the phenomenon in Liesegang rings. Zinc sulphate can synergize disodium ethylene bisdithiocarbamate by liberating sodium sulphate into the medium which causes the toxicity to rise until all the sodium has been displaced. Apparently the increased permeation more than counterbalances the reduced toxicity of the zinc salt. Calcium in the mixture neutralizes much of the effect.

Horsfall (J. G.), Turner (N.), & McDonnell (A. D.). **Inter-actions of concentration, pressure, time, and orifice in spraying.**—Abs. in *Phytopathology*, xxxvi, 8, p. 680, 1946.

The interactions of various factors in spraying were studied by varying the amounts of material applied per acre, using Bordeaux mixture on potatoes or calcium arsenate on beans [*Phaseolus vulgaris*]. The rate of deposit increased most with concentration and less with time, pressure, and orifice diameter in that order. Deposit increased more rapidly with short than with long spray time, with low than with high pressure, and with small than with large orifices. Using a constant concentration, calcium arsenate deposited best on potatoes with high pressure, short time, and small orifices. Deposits may, however, have different tenacity and coverage according to the technique employed. The larger the deposit of calcium arsenate, the faster it was washed off by the rain. Applications with short spray times, therefore, washed off more rapidly than those from longer ones, which tended to nullify the advantage of original deposition. An assay of coverage was attempted, using the log-probit dosage-response curve with Bordeaux mixture and leafburn on potato. The laboratory conclusion that good coverage should be shown by a steep slope was not confirmed; a strong concave curvature resulted, presumably attributable to the more rapid washing-off of larger deposits.

Raucourt (M.) & Bégué (H.). **Revue de phytopharmacie. VI.** [Review of phytopharmacy. VI.]—*Ann. agron.*, iii, pp. 451–486, 1942. [Abs. in *Rev. Bot. appl.*, xxiii, 257–259, p. 66, 1943. Received October, 1946.]

In this paper of the present series [cf. *R.A.M.*, xxv, p. 461] the authors deal with physical methods used to study the fineness of dusts employed for purposes of plant-disease control, [ibid., xxv, p. 433], copper salts, tar oils, fumigation gases, insecticides derived from plants, and miscellaneous fungicides.

Chadefaud (M.). **Biologie des champignons.** [The biology of fungi.]—267 pp., 50 figs., Paris, Librairie Gallimard (Collection L'Avenir de la Science), 1944. [Received November, 1946.]

In this book the author has confined himself mainly to a study of the reproductive organs and sexual cycles of fungi [Eumycetes], with a discussion of their origin and phylogeny. He does not share the generally accepted views on some aspects of these matters, but expresses a personal opinion on a number of points, including the morphological value of the mycelial structures, the phylogenetic independence of the Phycomycetes on the one hand and the rest of the Eumycetes on the other, the theory of the Floridean origin of the latter, and the reversion to the name Mycetozoa with the relegation of this group to the Protozoa.

WILKINS (W. H.) & HARRIS (G. C. M.). **The ecology of the larger fungi. V. An investigation into the influence of rainfall and temperature on the seasonal production of fungi in a Beechwood and a Pinewood.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 179–188, 8 graphs, 1946.

In continuation of the study of the ecology of the larger fungi [*R.A.M.*, xix, p. 421] the authors present a survey, covering the year 1936, of the seasonal distribution of larger fungi in a pine wood and a beech wood in Berkshire, correlating the numbers and species found with the temperature, rainfall, moisture content of the substratum, and the effect of the canopy. They conclude that as for grasslands the water content of the substratum and temperature are the principal factors governing sporophore production. For the beech wood it is estimated that the water content should be above 50 per cent. and the arithmetic mean of minimum temperatures above 4° C. There is, however, a lag phase between the onset of favourable conditions and sporophore production, which is shorter for species with small fructifications and longer for the larger ones. The effect of the canopy is to reduce the amount of rain reaching the substratum, but this is more than offset by the reduction of temperature extremes, thus making a wood a more favourable habitat than open country for the fungi and contributing to a longer season.

GOTT (CORA L. T.) & GOLDSMITH (G. W.). **A method for the macroscopic study of root diseases.**—*Phytopathology*, xxxvi, 8, pp. 667–670, 1 fig., 2 graphs, 1946.

A modification of Pirone's method for the commercial propagation of plants without the use of soil or of any type of solid medium (*Science*, xciv, p. 74, 1941) is described. Germinating cotton and maize seedlings were held between a vertical sheet of glass and filter paper. The paper folds over into a pan of nutrient solution maintained at a constant level from a reservoir. The growth of the roots could thus be followed. The cotton seedlings grown in this way were killed after inoculation with *Phymatotrichum omnivorum*. Maize, which is immune from *P. omnivorum* in the field, became susceptible to attack, but was not killed. Withholding magnesium from the nutrient solution, however, rendered the maize seedlings susceptible to lethal attack by *P. omnivorum*.

GAÜMANN (E.). **Types of defensive reactions in plants.**—*Phytopathology*, xxxvi, 8, pp. 624–633, 5 figs., 1946.

This paper describes shortly, with a consistent terminology, the six types of defensive reaction of plants to pathogens discussed in detail in the author's book, 'Pflanzliche Infektionslehre' [*R.A.M.*, xxv, p. 173], namely, (1) the plasmatic anti-infection reactions, which operate (*a*) by altering and weakening the invading parasite, (*b*) by localizing the intruding pathogen, and (*c*) by digesting and eliminating the intracellular parasites; (2) the necrotic reactions caused by hypersensitiveness of the host cells; (3) premunity [ibid., xxiii, p. 139], based upon an alteration of the host effect by pre-infection, through which the host has gained a power of resistance not originally possessed; (4) histogenic demarcations aimed at localizing the disease focus; (5) gummous demarcations; and (6) induced tolerance.

SNYDER (W. C.) & HANSEN (H. N.). **Control of culture mites by cigarette paper barriers.**—*Mycologia*, xxxviii, 4, pp. 455–462, 2 figs., 1946.

A description is given of a method of controlling mites that infect cultures which has given satisfactory results for over six years. After a culture has been made, the cotton plug is pushed below the rim, which is then flamed. The tube is held upside down and the flamed rim pressed gently with a rotary motion against the surface of solidified gelatine (20 per cent. with 2 per cent. copper sulphate added) until it is coated with a thin film of gelatine. The rim is then placed against cigarette papers (cut in half and sterilized in a Petri dish) so that the top sheet

adheres to it. It is made to adhere tightly by pressing it firmly against a blotter. The tube is next placed upright in a rack with others similarly prepared, all being so arranged that the corners of the projecting pieces of paper touch. When ignited at a single point, the projecting paper on all the tubes will burn off, leaving neat, circular paper seals that effectively keep out all contaminants. When subcultures are required, the seal is burned off by flaming, and after the transfer is complete the tube may be re-sealed.

This paper barrier is so effective that cotton plugs need be used only until the medium is seeded. Of many brands of cigarette paper tested the only ones found satisfactory were white cigarette papers of the L.L.F. (Riz La Croix), Tip Top, OCB, and Black Sea brands, and of these L.L.F. was the most suitable, because it left the least ash.

SMITH (G.). **Recent progress in industrial mycology.**—*Sci. Progr.*, xxxiv, 136, pp. 670–680, 1946.

The author succinctly reviews the known methods for preventing mould growth, e.g., improved packing, use of mould-resistant and mould-proofed materials, and antiseptics for the protection of textiles and other materials subject to moulding. He then turns to the uses of moulds, and deals with penicillin and other antibiotics. The paper concludes with a brief survey of recent publications on the taxonomy of moulds, reference being made to the present lack of trained taxonomists in Britain.

HERRELL (W. E.). **Penicillin and other antibiotic agents.**—xv+363 pp., 32 figs., 13 graphs, Philadelphia and London, W. B. Saunders & Co., 1945. 25*s*.

This comprehensive treatise deals mainly with results of experimental and clinical studies on the uses of penicillin in particular and other antibiotics in general. The first part surveys the development of penicillin, methods of preparation, properties, anti-bacterial activity *in vitro* and *in vivo*, its physiological behaviour in the living body, methods of standardization, and its detection in body fluids. The second and third parts are concerned with the clinical use of penicillin. Part four treats in a similar manner tyrothricin (gramicidin and tyrocidine), streptothricin, and streptomycin and summarizes the knowledge to date of other known antibiotics, including actinomycin, penicillic acid, gliotoxin, claviformin (clavicin and patulin), flavicin, and flavicidin. Each chapter ends with a full bibliography.

CHANDLER (VELMA L.) & SHAW (R. D.). **Dropping device for cylinder plate assay of penicillin.**—*Science*, civ, 2699, 1 fig., 1946.

A description is given of a mechanism devised by R. D. Shaw for use in the cup-plate method of assay of the potency of antibiotics. It sets four or six sterile cylinders simultaneously on the agar surface at evenly spaced distances and from exactly the same height. With this apparatus an average of 10 plates per minute can be cupped.

JOHNS (M. E.), PHILPOT (FLORA J.), & POLLOCK (A. V.). **Moulds producing penicillin-like antibiotics.**—*Nature, Lond.*, clviii, 4013, p. 446, 1946.

Antibiotics resembling penicillin have been shown to be produced by the following species of *Penicillium*: *P. steckii* [*R.A.M.*, xxii, p. 13], *P. chloroleucon* [ibid., xxiv, p. 242], *P. asperulum*, *P. crateriforme*, and *P. griseo-fulvum* [loc. cit.].

BRIAN (P. W.), CURTIS (P. J.), HEMMING (H. G.), & MCGOWAN (J. C.). **The production of viridin by pigment-forming strains of Trichoderma viride.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 190–200, 6 graphs, 1946.

The authors present extended studies [*R.A.M.*, xxiv, p. 427] on the production, properties, and highly fungistatic activity of viridin, derived from yellow strains of *Trichoderma viride*.

In emphasizing the importance of the depth of the medium in determining the fungistatic activity of culture filtrates, it is pointed out that there is an optimum depth varying with the strain used and that on shallow layers (0·5 cm.) a peak of activity is usually reached about the sixth day of incubation at 25° C., followed by a rapid decline.

The striking specificity of viridin was demonstrated by the inhibition of the conidial germination of *Botrytis allii* at 0·006 μg. per ml., whereas 6·25 μg. per ml. was required to prevent it in the case of *Penicillium expansum*. Concentrations above 50 μg. per ml. were needed to kill conidia of *T. viride* and for *B. allii* one a thousand times greater than the minimum required to inhibit germination was necessary to destroy the spores entirely in two hours. A distinctive characteristic of viridin is that, alone among antibiotic mould products so far described, it exercises little or no bactericidal effect.

Acidity is essential to stability of viridin in aqueous solutions; at pH 2·9 half the activity remains after 14 days at 25°, but at pH 5·8 all activity is lost in a day, and at pH 8·4 it ceases immediately. Aqueous solutions are inactivated by peptone and yeast extract, and by several pure chemical compounds likely to be present in such materials.

Wilkins (W. H.). **Investigations into the production of bacteriostatic substances by fungi. Preliminary examination of more of the larger Basidiomycetes and some of the larger Ascomycetes.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 188–190, 1946.

The results of testing sporophore extracts of 65 species of Basidiomycetes and 34 species of Ascomycetes [*R.A.M.*, xxiv, p. 158] for their antibiotic properties against *Bacterium coli* and *Staphylococcus aureus* are recorded in this paper, 28 of the 99 fungi yielding extracts active against one or both of the pathogens.

Atkinson (Nancy). **Antibacterial activity in members of the higher fungi 1. Cortinarius rotundisporus and Psalliota xanthoderma Genev.**—*Aust. J. exp. Biol. med. Sci.*, xxiv, 3, pp. 169–173, 1946.

Anti-bacterial activity against a wide range of bacteria, including the Gram-positive *Staphylococcus aureus*, the Gram-negative *Bacterium typhosum*, and the acid-fast *Mycobacterium phlei* and the vole type of tubercle bacillus, was exerted by aqueous extracts of *Psalliota xanthoderma* and *Cortinarius rotundisporus* collected in various parts of South Australia [*R.A.M.*, xxv, p. 308]. The antibiotic substance was probably different in each fungus, since the two extracts did not behave uniformly. In neither extract was activity impaired by the presence of 10 per cent. serum. The toxicity of crude preparations to mice was of a low grade.

Bose (S. R.). **Hereditary (seed-borne) symbiosis in Casuarina equisetifolia Forst.**—Abs. in *Proc. Indian Sci. Congr.*, xxxi, Part III, pp. 62–63, 1944. [Received 1946.]

The symbiotic fungus previously reported in *Casuarina equisetifolia* [*R.A.M.*, xxiii, p. 352] has been provisionally identified as *Phoma casuarinae* Tassi. It occurs in the pericarp wing of the fruits and in the seed coats, infecting the emerging radicles, and its quinqueseptate hyphae can be discerned among the dense rows of root hairs when the seeds are germinated on moist filter paper in Petri dishes. Roots of a cutting from an infected plant bore the typical hyphae of the fungus both externally and internally, and the mycelium was also present in all the other organs of the host except the endosperm and the embryo. Thus, every *C. equisetifolia* plant is a dual organism, harbouring a fungus in its seeds, so that the symbiotic relationship becomes hereditary.

Sporadic formation of ectotrophic mycorrhiza has been experimentally induced in the roots of a number of seedlings, which in the course of three to four months

developed bunches of coralloid roots. An examination of the fruits of seven other *C.* spp. from Australia invariably disclosed the presence of coils of septate hyphae in their pericarp wings.

MANNS (T. F.). **What is net necrosis of Potato?**—Abs. in *Phytopathology*, xxxvi, 8, pp. 686–687, 1946.

The results of a spraying experiment, in which DDT, with or without calcium arsenate, was used to control leafhoppers on potatoes, showed that net necrosis developed rapidly in store in the tubers of unsprayed plants. In addition no leaf roll developed on plants affected with net necrosis although pathologists tend to associate the two diseases [*R.A.M.*, xviii, p. 788]. The author concludes that this evidence, coupled with observations covering 35 years that severe net necrosis always occurs during seasons of much leafhopper injury, indicates that net necrosis is leafhopper injury.

McDONALD (J.). **Annual report of the Department of Agriculture, Cyprus, for the year 1945.**—8 pp., 1946.

On p. 7 of this report [cf. *R.A.M.*, xix, p. 198] it is stated that during 1945 the potato crop grown in Cyprus from imported Arran Banner seed was considerably affected by 'sprain' [spraing: ibid., xxiii, p. 89; xxiv, p. 385]. The disease did not appear to be contagious, and no specific organism was isolated from affected material. The Up-to-Date variety was unaffected, and all crops grown from home-produced seed remained healthy.

BAWDEN (F. C.) & KASSANIS (B.). **Varietal differences in susceptibility to Potato virus Y.**—*Ann. appl. Biol.*, xxxiii, 1, pp. 46–50, 1946.

Individual potato varieties differ not only in their symptomatological response to infection with potato virus Y, but also in their susceptibility to infection, in the virus concentration developed in their sap, and as sources of virus for aphids. The writers' experiments both in the field and under glass confirm previous observations of commercial crops [*R.A.M.*, xviii, p. 813; xix, p. 671; xxii, p. 222] and demonstrate the differences in the readiness with which varieties absorb the infective principle and in the virus content each develops. As response to the disease in the field is closely related to the degree of susceptibility, it is held that relative varietal field behaviour may be reliably predicted by the results of transmission tests with aphids.

In small-scale field trials at Rothamsted in 1942 and 1943, and at the Midland Agricultural College, Sutton Bonington, in 1942, where healthy plants surrounded infected ones, one with leaf roll and another with virus Y, although there was a wider incidence of virus infection at Rothamsted than at Sutton Bonington, in all three tests the relative susceptibility of the varieties was the same. Arran Banner and Majestic proved most resistant, with 45 per cent. infection, and Arran Pilot and May Queen most susceptible with 90 per cent. Some varieties became infected mainly with virus Y (Arran Pilot) while others had more leaf roll (Arran Consul). Katahdin exhibited remarkable resistance which was observed also in glasshouse inoculation experiments, while the British varieties all showed systemic infection and the only differences observed were in the type of symptoms induced. Inoculation of healthy tobacco and potato plants with dilute virus Y-infected tobacco sap produced 100 per cent. infection in the former but not in the potato varieties. More infections occurred in Arran Pilot and May Queen, which develop mosaic symptoms, than in Arran Consul and Gladstone, which react with local lesions and systemic necrosis.

In transmission experiments with aphids (*Myzus persicae*) Katahdin again proved to be resistant to virus Y and Ulster Monarch nearly as susceptible as tobacco.

Most of the common British varieties gave an intermediate response in their reaction, Majestic, Arran Banner, Redskin, Sharpe's Express, Gladstone, and Kerr's Pink showing a 15 to 30 per cent. range of infection and Arran Pilot, King Edward, and May Queen from 50 to 60.

Aphids which had fed on infected tobacco or different potato varieties were transferred to healthy tobacco seedlings. The aphids were shown to become more viruliferous after feeding on tobacco than on potato and, except in the case of the May Queen variety in the first year of infection, the percentage of healthy tobacco plants infected corresponded closely to the precipitin titres of the source plants. Sap from Majestic with a virus content of 0·25 infected only 8 per cent., while that from Arran Banner with a content of 5 infected 55 per cent. of the tobacco plants; thus, sap of the more resistant variety proved more virulent to tobacco than that of the more susceptible. Therefore, the multiplication of the virus once established in a plant is not necessarily correlated with liability to infection. The different reactions of British varieties when exposed to the same conditions are sufficiently great to be of economic importance and they explain why once-grown seed of Arran Banner usually yields well, while Arran Pilot seed produced under the same conditions does not.

The results of these small-scale field trials suggest that tests can be made early in the life of seedlings provided that they are set up in districts where leaf roll and potato virus Y spread fairly rapidly. It is considered that Katahdin might react differently to other strains of virus Y, of which only one source was used in the course of these experiments.

ALABOUVETTE (L.). **Le mildiou de la Pomme de terre.** [Potato late blight.]—*Progr. agric. vitic.*, cxxv, 22–23, pp. 364–368, 1946.

The author gives a succinct account in semi-popular terms of potato late blight (*Phytophthora infestans*), with special reference to French conditions [cf. *R.A.M.*, xviii, p. 814; xxv, p. 469], the points dealt with including the symptoms, the biology of the fungus, the effect of meteorological factors on the disease, resistance, resistant varieties, and control. In Brittany, sporangia are found in February on discarded potatoes left near the storage places.

STÖRMER [INGE] & EBELL (MARIE). **Rhizoctonia-Bekämpfungs-Versuche.** [*Rhizoctonia* control experiments.]—*Mitt. Landw., Berl.*, lix, 16, pp. 352–353, 1944.

Rhizoctonia [*Corticium solani*] is steadily gaining ground in Germany and now occupies the first place, at any rate in the north-east, as a parasite of potatoes [*R.A.M.*, xxiii, p. 405]. With the extension of the crop to cover an area of 25 to 33 per cent. of the total under cultivation, a cumulative increase in the amount of soil inoculum produced by the saprophytic phase in the life-cycle of the fungus is to be expected.

In 1936 experiments were carried out at Dramburg, Pomerania, in collaboration with [H.] Braun, of the Biological Institute, Dahlem, Berlin, to determine the influence on the course of the disease of (1) planting time, (2) planting depth, and (3) adhesion of the sclerotia to the tubers. The varieties used were Herulia and Merkur, both supplied by the Pomeranian Seed Association. The difference in the incidence of infection between the two planting dates (5th and 20th May) was inconsiderable, barely exceeding the margin of error; the numbers of severely diseased sprouts were 288·7 and 268·7, respectively. The general recommendation of shallow planting for potato tubers proved to be well founded in these trials, in which 339 sprouts were attacked in the deeply planted plots (15 cm.) compared with 218·4 in the shallow (5 cm.). Tubers encrusted with sclerotia gave rise to 370·9 severely infected shoots as against 186·5 in the plots planted with sclerotia-

free material. Promising results in the elimination of these organs were given by soil disinfection with the preparation 'P' (I. G. Farben), as reported in *Nachr. SchädlBekämpf., Leverkusen*, 2, 1939 [cf. also *R.A.M.*, xvii, p. 545]. In connexion with late planting, the authors draw attention to the risk from aphid-borne viruses which may well outweigh the benefit of a reduction in the incidence of *C. solani*.

APPEL. **Auflaufkrankheiten der Kartoffel und ihre Verhütung.** [Emergence diseases of the Potato and their prevention.]—*Mitt. Landw., Berl.*, lix, 17, pp. 383–384, 1944.

No convincing explanation appears to be forthcoming of two pathological conditions reducing the emergence of potato tubers in Germany, one characterized by the production of slender, sickly 'threads' in place of normal sprouts and the other by the development of a number of under-sized tubers from the eyes. Gaps in the stand may also be due to exceptionally severe involvement of the tubers by scab [*Actinomyces scabies*] or *Phytophthora* [*infestans*]. *Rhizoctonia* [*Corticium solani*: see preceding abstract], in addition to its attacks on the growing crop, is also an agent of heavy damage to the emerging sprouts, killing them in succession as they are produced from the reserve 'eyes' of the tuber until complete exhaustion ensues.

SMALL (T.). **Dry rot of Potato (Fusarium caeruleum (Lib.) Sacc.). Effect of planting infected and contaminated sets on plant establishment.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 219–221, 1946.

In experiments from 1942 to 1945 with the Ninetyfold, Majestic, and Doon Star varieties of potato, healthy whole sets inoculated with *Fusarium caeruleum* [*R.A.M.*, xxiv, p. 201] internally three days before planting gave good stands, whereas whole sets with obvious dry rot lesions yielded stands with gaps. Healthy cut sets produced satisfactory stands except in one test with Doon Star, while those cut with a contaminated knife at planting time gave only a few misses in 1943 but many in the unfavourable season of 1944 and in 1945.

THOMAS (D. G.). **Powdery mildew of Potato.**—*Nature, Lond.*, clviii, 4012, pp. 417–418, 1946.

Potato powdery mildew (? *Erysiphe cichoracearum*) [*R.A.M.*, xiii, p. 681; xxiii, p. 253; xxiv, p. 471] was again observed at Cambridge in the late summer of 1945, on seedling plants in the greenhouse and on potatoes in trial plots in the open. It was found to be prevalent throughout the whole of the area within a ten-mile radius of the town and the heaviest attacks were in the south-west of the county. It was not observed on the varieties Kerr's Pink, Gladstone, and Red Skin, or on any solanaceous plant other than potato. Inoculation tests on plants related to the potato and on species known to be susceptible to *E. cichoracearum* gave positive results only with White Burley tobacco. In the greenhouse and trial plots the mycelium was more abundant on the upper surface of the leaves, while in the field the lower surface was that usually attacked. Round to oval patches about 1 to 3 cm. in diameter developed, and sometimes coalesced. No infection of the petioles or stems was observed [cf. ibid., xv, p. 604]. The subglobose to ovate haustoria, which formed in the epidermal cells, measured approximately 41·5 by 27·5 μ, and the mean dimensions of the conidia were 29·6 by 16·8 μ. No perithecia were observed. No reports of a powdery mildew on potatoes have been recorded from any part of Great Britain except Cambridge.

VENKATAKRISHNAIYA (N. S.). **Ephelis on two new hosts.**—*Curr. Sci.*, xv, 9, pp. 260–261, 2 figs., 1946.

Ephelis oryzae, a common pathogen of rice in several parts of India [*R.A.M.*, xvii, p. 295; xxiv, p. 472], was observed in 1943–4 in the vicinity of diseased crops

on two grasses, *Isachne elegans* and *Eragrostis tenuifolia,* the former at Nagenhally, Mysore, and the latter at Hebbal, Bangalore. The infected plants were stunted, with a silvery-greyish lustre on the blades, and the normally loose panicles, 3 to 6 in. long, were reduced to black spikes, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long. The mycelium forms a dirty grey, later black, sclerotioid mass, enveloping the florets and spikelets and uniting them with the main rachis. The acicular, hyaline, vacuolate conidia, 16 to 28 by 1·3 to 2 μ, form a gelatinous matrix on detachment from the conidiophores. These dimensions agree with those of the rice strain of the fungus (17 to 28 by 1·7 μ), to which the grass parasite is accordingly referred pending further observations on its perfect state *Balansia oryzae* (Syd.) Narasimhan and Thirumalachar (*Curr. Sci.*, xii, p. 276, 1943).

Bocquet. **État actuel des plantations d'Hévéa en Indochine.** [The present condition of the Rubber plantations in Indo-China.]—*Rev. Bot. appl.*, xxii, 247–248, pp. 180–190, 1942. [Received October, 1946.]

In this paper (composed of extracts from an article on the condition of the rubber plantations in Indo-China during 1940 which appeared in *Rev. gén. Caoutch.*, xviii, 170, pp. 327–332, 1941) it is stated that the most important diseases found in this region are *Corticium* [*salmonicolor*], stripe canker [? *Phytophthora palmivora*: cf. *R.A.M.*, xxiii, p. 290], and 'patch' canker [? *Pythium complectens*: cf. ibid., xx, p. 321]. *C. salmonicolor* attacks the trees during their second or third year of cultivation, and reaches its full development towards the fifth or sixth year, when many plantations show 100 per cent. infection. Stripe canker develops when the first rains fall, in June or July, but its worst effects are experienced between October and December. 'Patch canker', or what is called by that name locally, though it appears to differ somewhat from the form of the disease found elsewhere, has appeared in the last two or three years [before writing] on the tapping panels of certain grafted varieties, particularly B.D. 5. In some plantations up to 50 per cent. of the trees are affected. It is considered that this disease may be a more serious form of stripe canker which affects clones with a susceptible bark.

Langford (M. H.). **Regional differences in resistance of Hevea selections to South American leaf blight.**—Abs. in *Phytopathology*, xxxvi, 8, p. 686, 1946.

Tests with a varied collection of *Hevea* rubber seedlings and clones against South American leaf blight (*Dothidella* [*Melanopsammopsis*] *ulei*) [*R.A.M.*, xxv, p. 72] in widely scattered tropical American nurseries during the past five years have shown the sensitivity of the fungus to weather conditions. This, together with the regional variation in disease severity, has necessitated thorough resistance tests in several localities for reliable selection work. Groups of clones from several widely separated areas in the natural habitat have been grown under comparable exposure to blight in regional test plots in Costa Rica, Panama, Trinidad, Brazil, and Peru. Also, numerous seedlings from jungle trees have been tested at their place of origin and elsewhere. Clones and seedlings, highly susceptible in some areas, have been unaffected or only slightly damaged in some others. Prolonged exposure, however, has disclosed many cases of increased disease incidence as variants of the fungus were encountered. Some clones which have proved sturdily resistant in all areas are now recommended for commercial use.

Rands (R. D.). **Progress on tropical American Rubber planting through disease control.**—Abs. in *Phytopathology*, xxxvi, 8, p. 688, 1946.

Reference is made to the co-operative research on tropical rubber-planting conducted since 1940 by the United States Department of Agriculture and to technical

guidance furnished to 13 tropical American Republics interested in rubber-planting, including the control of leaf blight (*Dothidella* [*Melanopsammopsis*] *ulei*) by Langford's spraying methods [*R.A.M.*, xxiii, p. 455] and crown-budding with resistant Ford selections [ibid., xxv, p. 71].

The development of commercial planting has progressed so that by 1944 more than 28,000 acres of high-yielding rubber had been established. The value of permanent, self-sustaining, small-farm, or single-family type of rubber production is emphasized. The planting of crown-budded oriental clones has been accompanied by a co-operative breeding programme [see preceding abstract] which has supplied thousands of F_1 and F_2 hybrids, some of them likely to combine high yield with blight resistance.

Presley (J. T.). **Diplodia die-back of Guayule (Parthenium argentatum Gray).**—*Phytopathology*, xxxvi, 7, pp. 565–571, 2 figs., 1946.

Two-year-old irrigated guayule (*Parthenium argentatum*) in south Texas suffered severely from die-back due to *Diplodia* [*Botryodiplodia*] *theobromae* during the late summer and early autumn of 1945. Infection usually originates in the leaves or twigs and proceeds downwards. In the field the first foliar symptoms are irregular, necrotic, rapidly coalescent lesions, leading to the death of the leaf, with conspicuous yellowing after half the blade has been killed. From the twigs the fungus passes downwards to the larger branches, girdling and killing them, while the foliage turns yellow. Infections near soil-level cause the girdling and collapse of the whole plant. Under humid conditions the black pycnidia of the fungus are produced beneath the dead bark and erupt as elongated, carbonaceous masses.

Small seedlings grown in soil sprayed with a spore suspension of *B. theobromae* commonly succumbed to the pathogen, especially at 80° F. Leaf and twig infections in the greenhouse were successful only when the humidity was maintained at a high level for 24 hours and upwards and temperatures ranged from 80° to 90° F. Old plants with hardened dry leaves were more susceptible than young, succulent plants with green, active foliage.

Stiles (W.). **Trace elements in plants and animals.**—xi+189 pp., 12 figs., Cambridge, University Press, 1946. 4*s*. 6*d*.

Included in this useful manual on the relation of the trace elements to health and disease in plants and animals are an historical introduction to the subject and chapters dealing with methods of investigating micro-nutrient problems, trace-element deficiency diseases of plants, and the functions of trace elements in plants. A 22-page bibliography is appended.

Dutta (S.) & Chaudhuri (H.). **Fungus flora of the soil and reduction of carbohydrates by them.**—Abs. in *Proc. Indian Sci. Congr.*, xxxi, Part III, p. 62, 1944. [Received 1946.]

A gradual increase in the species and numbers of the mycoflora from unreclaimed to reclaimed soils was registered in an ecological survey of the Lahore district [*R.A.M.*, xvi, p. 773]. Soils from sewage farms were richer in fungi than those of rice fields [ibid., xix, p. 302] under irrigation, though after the harvesting of the crop the incidence generally rose. The genus *Aspergillus* predominated both in species and numbers, followed by *Penicillium*. Mucorales were absent from the unreclaimed soils owing to the lack of organic matter, but were well represented on the sewage farms. Members of this group were the most active reducers of starch. The development of soil fungi is promoted by an abundance of organic nutriment and a slightly acid reaction, and is more copious in the winter than during the summer months [cf. ibid., xiv, pp. 121, 140, *et passim*].

McM[ARTIN] (A.). **Report on mosaic disease survey.**—*S. Afr. Sug. J.*, xxx, 6, p. 311, 1946.

The position as regards sugar-cane mosaic in Natal [*R.A.M.*, xxv, p. 279 and next abstract] at the time of writing was as follows. On the south coast a severe focus of infection at Umzinto was spreading inwards; farther south a much smaller outbreak was observed at Port Shipstone, and between the two areas odd cases of the disease were encountered. On the north coast mosaic has been found in the Umdhloti Valley region and near Verulam, and the inspectors have reported infected stools in sections hitherto free from the disease. A similar situation exists at Tongaat. The importance of eradication of infected stools and of planting exclusively selected, healthy cane is strongly urged, and all cases of suspected infection should be submitted to the Mount Edgecombe Experiment Station for expert examination.

McMARTIN (A.). **Agricultural systems and the health of crops.**—*S. Afr. Sug. J.*, xxx, 7, pp. 327, 329, 331, 1946.

This is an abridgement of the author's Presidential Address to Section C of the South African Association for the Advancement of Science at the 44th annual meeting in Pretoria, July, 1946. The relationship between the various cropping systems—rotation, fallow, and monoculture—and plant health is examined and discussed with special reference to its bearing on the cultivation of sugar-cane in Natal. Among the new problems confronting the plant pathologist in this province is the extension of the area under fodder grasses, notably *Setaria* spp., to meet the needs of the developing dairying, cattle-fattening, and pig-rearing industries. Symptoms identical with those of sugar-cane mosaic [see preceding abstract] have recently been observed on *S. splendida*, which may therefore serve as a source of infection by the virus. Other aspects of the subject reviewed are crop nutrition and mineral fertilizers in connexion with disease.

ABBOTT (E. V.). **Sugar Cane disease situation in Louisiana.**—*Sug. Bull., N.O., 1946*, 1st June, pp. 129–130, 1946. [Abs. in *Sugar*, xli, 8, p. 59, 1946.]

Red rot [*Physalospora tucumanensis*] is now regarded as the most formidable threat to the health of Louisiana sugar-cane. The great difficulty of combating the disease lies in the insufficient resistance of the commercially desirable varieties, while a further complication is introduced by the number of physiologic forms of variable pathogenicity within the species. C.P. 28/11 is very resistant to red rot but does not enjoy wide popularity. A recent release, C.P. 36/105, is resistant, as also is C.P. 36/13, now at the secondary increase stations.

FERNANDEZ (J. A.). **Observaciones sobre royas.** [Observations on rusts.]—Reprinted from *Rev. Fac. Agron. Univ. Montevideo, 1944*, 36, 16 pp., 12 figs., 1944. [Received November, 1946.]

Uromyces lupini on white lupin (referred by Viennot-Bourgin in France to *U. renovatus*) [*R.A.M.*, xviii, p. 549] and *Puccinia purpurea* on sorghum are recorded for the first time in Uruguay. Notes are also given on *Puccinia poae* on *Poa annua* [ibid., xii, p. 484] and *P. maydis* on maize, the presence of which in the country was already known.

SINGER (R.). **Type studies on Agarics. II.**—*Lloydia*, ix, 2, pp. 114–131, 1946.

Descriptions are given of type and authentic specimens, preserved in herbaria in the United States, of certain members of the Tricholomataceae, Amanitaceae, Cortinariaceae, and Strophariaceae. Mention may be made of *Marasmius semiustus* [cf. *R.A.M.*, xi, p. 97]. This fungus often causes root disease of sugar-cane in the

Americas, though in Asia the disease appears to be due to a similar species, known as *M. plicatus* [ibid., iv, p. 23] or *M. sacchari* [ibid., xviii, pp. 624, 625], and American workers often erroneously determine the American root disease under these names. *M. semiustus* is 'omnivorous', and probably causes damage on crops other than sugar-cane. Its taxonomic position is ambiguous; it comes between *Marasmius* sect. Rameales Kühner and *Hemimycena* sect. Pseudoconidiophorae Sing. In the author's opinion, it would be best to remove the whole section Rameales from *Marasmius* and incorporate it in *Hemimycena*. Though Murrill identifies *M. semiustus* with *M. stenophyllus* [ibid., xx, p. 579] the description of the latter excludes such a synonymy.

GROVES (J. W.). **North American species of Dermea.**—*Mycologia*, xxxviii, 4, pp. 351–431, 57 figs., 1946.

In this study on all the species of *Dermea* known in North America, the author discusses the nomenclature of the group, the conidial states, host relations and parasitism, the taxonomy of the genus, and doubtful and excluded species. The evidence presented indicates that the species of *Dermea* are, in general, specific to their hosts. Little is known about the parasitism of most of the species, but they are, probably, at least weakly parasitic. Under favourable conditions some might be able to cause damage to the host, but in general they do not appear to be of much economic importance.

SAVILE (D. B. O.). **A new species of Stagonospora on Ambrosia.**—*Mycologia*, xxxviii, 4, pp. 453–454, 1 fig., 1946.

A brief description is given of *Stagonospora ambrosiae* n.sp., found on lesions of *Entyloma compositarum* on *Ambrosia trifida* (North Dakota) in the Mycological Herbarium of the Division of Botany and Plant Pathology, Ottawa.

WHIFFEN (ALMA J.). **Two new terricolous Phycomycetes belonging to the genera Lagenidium and Blastocladiella.**—*J. Elisha Mitchell sci. Soc.*, lxii, 1, pp. 54–58, 1 pl., 1946.

Full descriptions are given of two new terricolous Phycomycetes, including *Lagenidium pythii* n.sp. parasitic on a *Pythium*, from Cuba.

LIMBER (D. P.), POLLACK (FLORA G.), & JENKINS (ANNA E.). **Elsinoë discovered on Sesbania and Cinnamomum in the United States.**—*Mycologia*, xxxviii, 4, pp. 463–472, 3 figs., 1946.

Descriptions are given of two new species of *Elsinoë*, viz., *E. sesbaniae*, found in South Carolina on *Sesbania exaltata*, sometimes used as a green manure crop, and *E. cinnamomi*, found on *Cinnamomum camphora* in Mississippi. *E. sesbaniae* is characterized by ascomata measuring 46 to 75 by 14 to 40 μ, asci 11·5 to 16 by 11·5 to 15 μ, and ascospores 10 to 12 by 3·5 to 4·5 μ. Acervuli of the *Sphaceloma* stage are often found with the ascomata. They are poorly defined, consist of a dense palisade of pointed conidiophores measuring 4 to 7 by 1·5 to 2 μ, and produce hyaline, oblong-ellipsoid conidia 3·5 to 6 by 1·5 to 3·5 μ. *E. cinnamomi* shows pulvinate ascomata up to 500 μ in diameter by 40 to 80 μ in height, globose to ovoid asci measuring 20 to 36 by 12 to 20 μ which become elongated (48 by 8 μ) in water on rupture of the outer wall, and ascospores measuring 15 to 17 by 4 to 6 μ; in culture the conida are hyaline, oblong-ellipsoid, continuous, and measure 4 to 6 by 2 to 3·5 μ. The pycnospores measure 1·8 to 2·5 by 0·5 μ.

COKER (W. C.). **The United States species of Coltricia.**—*J. Elisha Mitchell sci. Soc.*, lxii, 1, pp. 95–107, 6 pls., 1946.

Descriptive notes (with a key) are given on the seven species included by Murrill (*N. Amer. Flora*, ix, pp. 91–94, 1908) in *Coltricia* [a segregate from *Polyporus*]

characterized, *inter alia,* by lack of setae, and brown spores. Five of these species appear to the author to form a very natural group and are retained in the genus. *Polyporus tomentosus* (in which Murrill includes *P. circinatus*) [*R.A.M.*, xxi, p. 174], parasitic or saprophytic on pine, with its conspicuous setae, duplex flesh, and white spores, seems out of place in *Coltricia* where Murrill placed it.

Haardick (H.), Kausche (G. A.), & Ruska (H.). **Elektronenmikroscopische Bestimmung der Konzentration von Tabakmosaikviruslösungen.** [Electron-microscopic determination of the concentration of Tobacco mosaic virus solutions.]—*Naturwissenschaften*, xxxii, 27–39, pp. 226–228, 3 figs., 1944. [Received October, 1946.]

Particulars are given of a method for the determination of the concentration of tobacco mosaic virus solutions by the electron-microscopic computation of the size of the aerosol mist droplets in the electric field, and of the rod length of the particles contained therein.

Holmes (F. O.). **A comparison of the experimental host ranges of Tobacco-etch and Tobacco-mosaic viruses.**—*Phytopathology*, xxxvi, 8, pp. 643–659, 2 figs., 1946.

The results of several years' tests to determine the experimental host range of the tobacco etch and tobacco mosaic viruses are presented, with a full tabulation of families and species tested and the effects of inoculations upon them with these two viruses. The conclusion is that species susceptible to strains of etch virus may usually be expected to prove susceptible to strains of the mosaic virus.

Of 310 plants inoculated, 83 were found to be capable of supporting increase of both viruses, 111 to be unable to act as hosts of either, 116 susceptible to mosaic but not to etch, while all those susceptible to etch reacted similarly to mosaic. The earlier conclusion [*R.A.M.*, xvii, 416] that plants susceptible to infection by the tobacco mosaic virus are largely confined to closely related families is confirmed and a similar but somewhat narrower host range is indicated for tobacco etch virus.

These two diseases cause closely similar symptoms in many plants, the etch virus commonly inducing a chlorotic mottling and only rarely etching. Their dissimilarity in respect of other properties is noticed. No other two viruses have such a wide host range, nor so predictable a relationship as regards the plants which they can infect. The similarity in their host requirements and the general likeness of the symptoms which they cause suggest some relationship, but a rather more distant one than that existing between varieties of a single virus.

Distribution maps of plant diseases.—Maps 97–120. Issued by the Imperial Mycological Institute, 1946. 3*s*. 9*d*.

The fifth year's issue of this series of maps showing the world distribution of major crop diseases [*R.A.M.*, xxv, p. 96] comprises (No. 97) *Puccinia glumarum* on wheat and other cereals and grasses, (98) *Ganoderma pseudoferreum* on *Hevea* rubber, tea, coffee, etc., (99) *Phytophthora cryptogea* on tomato, etc., (100) sugar-cane streak virus on sugar-cane, (101) *Plasmodiophora brassicae* on crucifers, (102) *Gibberella fujikuroi* on sugar-cane, etc., (103) lily rosette virus on lily, (104) *Fomes noxius* on *Hevea* rubber, etc., (105) *Pyrenophora avenae* on oats, (106) *Physoderma maydis* on maize, (107) elm phloem necrosis virus on elm, (108) *Septoria lycopersici* on tomato, (109) *Phytophthora infestans* on potato and tomato, (110) *Mycosphaerella fragariae* on strawberry, (111) potato yellow dwarf virus on potato, (112) *Cercospora concors* on potato, (113) *Puccinia pittieriana* on potato, tomato and *Solanum* spp., (114) *Entyloma dahliae* on *Dahlia*, (115) potato witches' broom virus on potato, tomato, and tobacco, (116) dahlia mosaic virus on *Dahlia*, (117) *Puccinia chrysanthemi* on chrysanthemum, (118) *Podosphaera leucotricha* on apple, pear, apricot, etc., (119) *Gloeosporium limetticola* on lime, and (120) *Venturia inaequalis* on apple.

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STEINBERG (R. A.). **Sporangial propagation of blue mold fungus on aseptically grown Tobacco seedlings.**—*Bull. Torrey bot. Cl.*, lxxiii, 5, pp. 417–418, 1946.

In order to obtain pure cultures of *Peronospora tabacina*, the agent of tobacco blue mould, which can be propagated only on its host, one-month-old Maryland medium broadleaf and Xanthi Turkish seedlings were grown in 200 c.c. Erlenmeyer flasks on 50 c.c. mineral agar at room temperature under 500 ft. candles of intermittent or continuous light from 3,500° white fluorescent lamps [cf. *R.A.M.*, xix, p. 439]. The lower leaf surfaces were inoculated with bits of sterile filter paper pulp which had been rubbed over a spore-covered leaf. The flasks were kept at the bottom of a lighted refrigerator in a glass moist chamber at 45° to 50° F. for seven days, after which they were removed from the moist chamber and transferred to the top of the refrigerator where the temperature was about 72°. Sporangia began to appear on the upper sides of the inoculated leaves on the seventh day and production reached a climax on the twelfth. Viable sporangia were still present on infected plants after three weeks in the lighted refrigerator and a further fortnight's storage in the dark at 41°. The fungus also fructified abundantly at a uniform temperature of 59° provided by a 25-watt tungsten lamp in a refrigerator of 5 cu. ft. capacity.

By these means *P. tabacina* was maintained for over a year, through 27 successive transfers, by the third of which all extraneous contaminants had been eliminated. The symptoms of infection were similar to those seen in nature, except for a greater profusion of sporangia on the upper than on the lower leaf surfaces. Infection was not confined to the inoculated leaves. Blackening at the leaf midrib and stem bases indicated the passage of the pathogen through these tissues. Abundant fructification also occurred on leaves detached immediately before inoculation, the bases of which had been plunged into the agar, and on turgid seedlings growing on agar that had almost completely dried out.

Light appeared to be essential to sporangial formation, which did not occur in flasks wrapped in black paper during the last fortnight of the three-week period, while darkness during the vegetative phase (first week after inoculation) partially or totally inhibited it. The seedlings on which sporangia were thus suppressed remained free from blue mould. All attempts to cultivate the fungus on artificial media were unsuccessful.

CLAYTON (E. E.). **Aerosol treatments for the control of Tobacco blue-mold disease.**—Abs. in *Phytopathology*, xxxvi, 8, p. 684, 1946.

A successful adaptation of the benzyl salicylate-cottonseed oil spray for the control of tobacco blue mould [*Peronospora tabacina*: *R.A.M.*, xxii, p. 115; cf. xxv, p. 583] to the aerosol [ibid., xxv, p. 4] type of treatment has been in use for two years at a concentration of 4 oz. benzyl salicylate and 1 gal. cottonseed oil. Either cartridges were loaded with 40 per cent. of the spray and 60 per cent. 'freon', or small high-pressure sprayers were charged with 43 per cent. spray and 57 per cent. acetone, air pressure being adjusted to about 110 lb. Small plants received six

minutes' spraying per 100 sq. yds. and large plants up to 14 minutes'. Excellent control was secured.

TROTTER (A.). **Sulla presenza di tumori radicali nelle coltivazioni di Tabacco di pieno campo.** [On the presence of root tumours in Tobacco plantations in the open field.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), x, pp. 65–80, 1 pl., 7 figs., 1946.

A full description is given of root tumours with the characters of those due to *Bacterium tumefaciens* [*R.A.M.*, xvii, p. 18] observed on Kentucky tobacco growing in the field at Padula (Salerno) and Magliano Sabino (Rieti), Italy. Some of the plants were stunted, showed sparse, small, rather contorted, pale leaves, and slow, if any, flowering. Tumours were found on the roots near the collar, though eelworms were not present. These swellings were most numerous and largest (5 to 7 cm. in diameter) where the main roots branched, and less numerous and smaller on the secondary roots, especially the more distal ones. Clusters of tumours were also found. All along the thicker roots tumours, about 1 cm. in diameter, sometimes unilateral, had formed. Still smaller tumours, 4 to 5 mm. in diameter, single or aggregated, were present near the ends of the secondary roots.

In the final stage studied by the author the tumours were dark brown, soft, not woody, and the tissues were decomposing. The surface was unequal and bore small protuberances resembling rudimentary shoots. Some of these grew and formed imperfect leaf clusters, which were conspicuously vascularized and provided with thick, multiseptate hairs. Occasionally, true buds formed with normal leaflets.

At Padula Burley tobacco was also affected, though slightly. The condition was first noted on Kentucky in 1940, but had probably been present three or four years. In 1941, it was much more prevalent and severe, about 30 to 40 per cent. or more of the plants being affected, especially in the more compact soils. The two-year tobacco–wheat rotation, and perhaps also a not too careful digging of the ground, favoured further spread. Where tobacco was grown with a longer rotation, especially with lucerne, yield was much more satisfactory. Young stunted plants examined one month after transplanting, i.e., at the end of June, showed no sign of tumour formation, though *Thielaviopsis basicola* was present, but the tumours were present by the end of July, which suggests that they appear when the plants reach their maximum vegetative growth, probably during some new phase of root development. In 1942, identical symptoms appeared on an epidemic scale at Magliano Sabino in Umbria on Padano, a variety of Kentucky.

Fully developed tumours showed the presence of *T. basicola*, apparently growing as a saprophyte. The tumours are attributed to *Bact. tumefaciens* on the grounds of their characteristics, the organism not having been isolated from them. The paper concludes with recommendations on control by the use of resistant varieties, the avoidance of wounds caused by insects, etc., and good cultural practices.

NOORDAM (D.). **Over het voorkomen van 'spotted wilt' in Nederland.** [On the occurrence of 'spotted wilt' in Holland.]—*Tijdschr. PlZiekt.*, xlix, 4, pp. 117–119, 1 fig., 1943. [Received November, 1946.]

There have been various references in the Dutch phytopathological literature since 1931 to the suspected occurrence of the tomato spotted wilt virus on tomato and other plants in Holland, including van Schreven's account of the so-called 'Huissen disease' [*R.A.M.*, xv, p. 181], which K. M. Smith regards as a complex with spotted wilt as one component. In 1942 J. Guittart observed among a number of *Richardia africana* plants two with the typical symptoms of the virus, which was successfully transmitted by means of expressed sap to *Hippeastrum hybridum*, *Gloxinia hybridum*, *Nicotiana glutinosa*, *Solanum capsicastrum*, tomato, and peas [ibid., xvi, p. 134]. No extended observations on the disease or *in vitro* identifica-

tion tests have yet been carried out, but it is deemed advisable to call attention to this further corroboration of previous evidence pointing to the existence of the tomato spotted wilt virus in Holland.

DOOLITTLE (S. P.), PORTE (W. S.), & BEECHER (F. S.). **High resistance to common Tobacco mosaic in certain lines of Lycopersicon hirsutum.**—Abs. in *Phytopathology*, xxxvi, 8, p. 685, 1946.

Although the majority of plants of *Lycopersicon hirsutum*, highly tolerant to the yellow and green strains of the tobacco-mosaic virus [*R.A.M.*, xviii, p. 824], offer no symptoms on inoculation, there are varying and high concentrations of the virus in the inoculated plants. In 1941, however, two symptomless plants, after inoculation with the yellow strain, were found to be free from virus when tested by inoculation on *Nicotiana glutinosa* and all attempts to infect these plants failed. Repeated inoculations of 38 young and vigorous cuttings of one clonal line from one of these plants during the past four years have failed to induce infection. In the second clonal line, five out of 42 cuttings showed a trace of virus after inoculation, but the remaining plants were uninfected. Trials with the seed progeny of these lines have been restricted by the difficulty of securing seed of *L. hirsutum*, but 21 of 58 inoculated seedlings showed no infection. Crosses between these lines and commercial tomato varieties have yielded tolerant individuals, but none have exhibited the high resistance of the wild parents.

VAN KOOT (Y.) & PATTJE (D. J.). **Vergeling van Tomatenplanten tengevolge van magnesiumgebrek.** [Chlorosis of Tomato plants in consequence of magnesium deficiency.]—*Tijdschr. PlZiekt.*, xlviii, 5, pp. 121–137, 2 pl., 1942. [English summary. Received November, 1946.]

Tomato plants in Westland, Holland, suffer from two forms of chlorosis, namely, (1) in which the entire leaf blade turns yellow except for the tissue bordering the main veins, and (2) a much finer mottling, leaving all the veins green, even the smallest. The former type is due to magnesium deficiency [*R.A.M.*, xxiv, p. 389; xxv, pp. 15, 291] and the latter to a shortage of available manganese [ibid., xx, p. 282; xxi, p. 310] and a high pH.

Leaves affected by the magnesium-deficiency form of chlorosis swell and become brittle owing to the accumulation of starch within them, a similar feature having also been observed in neighbouring *Solanum nigrum* plants. The symptoms being suggestive of a virus disease, transmission experiments were carried out by several methods with negative results. Plants in gravel cultures deprived of magnesium developed the typical chlorosis described under (1) above.

BAKKER (MARTHA). **Resistentie tegen de bladvlekkenziekte van de Tomaat, in de practijk 'meeldauw' genoemd.** [Resistance to the Tomato leaf spot disease known in practice as 'mildew'.]—*Meded. Direct. Tuinb., 1946*, March, pp. 167–169, 1946.

At the Sappermeer Experiment Station, Holland, the Vetomold tomato variety, which is reputedly immune from leaf mould (*Cladosporium fulvum*), is now and then attacked by the disease [*R.A.M.*, xxv, p. 528], and a highly resistant local selection, the so-called 'meeldauwvrije' [mildew-free], has also shown traces of infection under very adverse conditions. Physiologic specialization within the pathogen may perhaps explain this occasional failure of resistance.

FENNELL (J. L.). **A new Tomato for the tropics.**—*Agric. Amer.*, v, 12, pp. 233–235, 2 figs., 1945.

An account is given of the development at the Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica, of the Turrialba tomato variety, a

cross between the wild berry tomato, *Lycopersicon esculentum* var. *cerasiforme*, and Cuban Marglobe. The new variety, which is to be perfected as rapidly as possible for general distribution, is characterized by high resistance to *Alternaria solani*.

HEUBERGER (J. W.). **Tomato anthracnose control.**—*Canning Tr.*, lxviii, 38, p. 22, 1946.

Independent investigations in Delaware and Ohio in 1944 revealed the superiority of zerlate (zinc dimethyl dithiocarbamate) [*R.A.M.*, xxv, p. 415] to an alternating schedule of fermate and fixed copper for the joint control of tomato anthracnose (*Colletotrichum phomoides*) [ibid., xxiv, p. 294] and early blight [*Alternaria solani*]. The former disease frequently leads to the rejection of the fruit on account of high mould count [ibid., xxv, p. 426] and is in consequence much dreaded by canners. In comparative experiments in Delaware during 1944 and 1945, when five spray applications were given, beginning 30 days after the first flower-cluster had bloomed and continuing at ten-day intervals, zerlate gave the best control of anthracnose, combated early blight as well as Bordeaux, and produced the maximum yield increases. In 1944 the percentage of infection by *C. phomoides* was reduced from 21·4 in the untreated plots to 4·2 in those sprayed with zerlate, the corresponding figures for Bordeaux (6–3–100), compound A (3–3–100), the alternating schedule of fermate 2–100 for the first, third, and fifth applications and tribasic copper sulphate for the second and fourth, fermate 2–100, and dithane [disodium dimethyl dithiocarbamate]-zinc sulphate-lime ($1\frac{1}{2}$–$1\frac{1}{2}$–100) being 7·8, 8·7, 10·2, 8·6, and 17·7, respectively. In 1945 the percentage of anthracnose in the unsprayed plots was 35·1 and in those treated with Bordeaux compound A, the alternating schedule, fermate, zerlate, and dithane-zinc sulphate-lime 12·3, 16·1, 12·3, 13·6, 4·6, and 17·8, respectively. The zerlate-treated plots yielded 9·5 tons fruit per acre in 1945, compared with 7·7 for the controls and 8·7 to 8·9 for the other sprays.

Zerlate is ineffectual against late blight [*Phytophthora infestans*], which is, however, a rarity in Delaware. In areas where it is a limiting factor, an alternating schedule of zerlate and a fixed copper should be used.

SPAULDING (P.) & BRATTON (A. W.). **Decay following glaze storm damage in woodlands of Central New York.**—*J. For.*, xliv, 7, pp. 515–519, 3 figs., 1946.

Northern hardwood stands in Otsego and Herkimer Counties, New York, were severely damaged by an ice storm in December, 1942. Early in 1945 sap rot had developed at the bases of beeches and sugar maples [*Acer saccharum*], the fungi responsible for the condition having apparently gained ingress through sun-scald injuries coinciding with the sudden opening of the stands. The organisms included *Daedalea unicolor* [*R.A.M.*, xix, p. 244], which was fruiting on nearly every affected tree and evidently one of the first and most destructive invaders, *Peniophora* sp., *Polyporus adustus*, *P. hirsutus*, *P. pergamenus*, *P. tulipiferus*, *P.* [*Polystictus*] *versicolor*, and *Schizophyllum commune*, the last-named being second in abundance to *D. unicolor* but causing only slight decay.

DILLER (J. D.), WHITTAKER (C. W.), & ANDERSON (M. S.). **Effect of mineral nutrition on the vigor and susceptibility to blight of old Japanese Chestnut trees.**—*Phytopathology*, xxxvi, 7, pp. 554–556, 1946.

An experiment was carried out to determine the effect of certain plant nutrient treatments on the incidence of blight (*Endothia parasitica*) [*R.A.M.*, xxiii, pp. 320, 367] in some surviving Japanese chestnuts (*Castanea crenata*) from a planting of 2,000 trees made 50 years ago near Fairfax Station, Virginia. Of the 64 trees selected for the investigation, 26 were inoculated during the winter of 1944–5 on nine lower branches of each tree with nine isolates of the pathogen from Massachusetts and nine from Maryland. The soil amendments consisted of phosphorus

and potash, applied on 2nd March, 1944, in 'punch holes' 2 ft. apart, at 100 and 75 lb. per acre, respectively, with or without nitrogen, broadcast at 150 or 300 lb. per acre, the last-named constituent, at both rates, also being repeated on some of the trees on 2nd March, 1945.

Neither the minerals nor nitrogen at the lower dosage significantly affected shoot growth, which was, however, materially increased by the first nitrogen treatment of 300 lb. (from an average total shoot length per tree of 175·6 to 223·1 cm.); the second-year application did not produce comparable effects. As regards canker incidence, the statistical data are more difficult to interpret and require further study, but it is evident that the mineral fertilizers enhanced susceptibility to the pathogen, an effect that was modified, however, in a complex manner by their combination with nitrogen. The pathogenicity of the longer-established group of Massachusetts isolates did not appear to have decreased in comparison with those from Maryland, which were made over ten years later.

KIMMEY (J. W.). **Notes on visual differentiation of White Pine blister rust from Pinyon rust in the telial stage.**—*Plant Dis. Reptr*, xxx, 2, pp. 59–61, 1946. [Mimeographed.]

For the purpose of distinguishing between *Cronartium ribicola* and *C. occidentale* [*R.A.M.*, xxiv, p. 127] in the field the author finds that the following five visually recognizable differences between the two rusts are useful. Teleutosori columns forming furry mats were common on leaves bearing *C. occidentale* but never found on those bearing *C. ribicola*. Columns of mature, ungerminated teleutosori of *C. occidentale* are generally a darker brown than those of *C. ribicola*, which are often orange. After germination of the teleutosori, the faded columns of *C. occidentale* usually present a lavender tinge, while those of *C. ribicola* do not. The failure of infected leaf areas to produce teleutosori after uredosori and the absence of the latter round infection spots were common features of *C. ribicola* but rare in *C. occidentale*; consequently a specimen with a considerable area of infection without columns of teleutosori is likely to be *C. ribicola*. In slight infections the pattern for *C. ribicola* takes the form of small spots scattered over the leaf surface, whereas with *C. occidentale* larger patches or continuous areas are present.

POMERLEAU (R.). **Relation entre le développement des caries du Sapin et le site.** [Relation between the development of Fir rots and the site.]—Abs. in *Ann. Ass. can.-franç. Sci.*, xii, pp. 79–80, 1946.

Previous studies in Canada and the United States have shown that the development of fir [*Abies*] rots is directly related to the age of the trees, and also that the percentage of the volume of decayed wood rises more rapidly among trees on a poor than on a fertile site. A comparative analysis of the results obtained in Quebec, New England, and the Great Lake States shows that, for a given age, the percentage of the volume and number of rotted trees is substantially lower in the boreal conifer forests than in those of the deciduous tree zone. Furthermore, the velocity of stem disorganization and of the brown butt rots increases *pari passu* with distance from the boreal zone. Using Heimburger's modified method, significant differences in the extent of fir rots were revealed in regard to each of the five recognized site types.

RICHENS (R. H.). **Forest tree breeding and genetics.**—Imperial Bureau of Plant Breeding and Genetics and Imperial Forestry Bureau, Joint Publication No. 8, 79 pp., 1945. [English, German, French, and Spanish summaries.]

This comprehensive study of forest tree-breeding and genetics, with a bibliography of over 14 pages, aims at presenting a synthesis of what appears most

important in the extensive literature, especially foreign, on this subject which has appeared since 1930.

Two introductory sections (15 pp.) present the general principles underlying tree-breeding and survey the criteria used by breeders in selecting new lines. Among these criteria is included resistance to bacteria, viruses, and fungi, but the first two are considered hardly to have come within the scope of breeders as yet. Breeding of varieties resistant to fungal diseases, however, offers a more promising and less costly method of combating the many serious pathogens of forest trees than large-scale control.

In sections III (Gymnosperms) and IV (Angiosperms) the available information on the selective criteria, discussed in the previous section, is summarized under the tree genera arranged alphabetically.

STARKER (T. J.). **Preservative treatment of fence posts: 1945 progress report on the Post Farm.**—*Bull. Ser. Ore. Engng Exp. Sta.* 9G, 16 pp., 1 fig., 1 graph, 1946.

At the eighth annual examination of the Post Farm at the Oregon State College on 20th December, 1945, 36 posts were removed on account of failure, compared with 29 in 1944 [*R.A.M.*, xxv, p. 242]. In an appendix directions are given for the application of a simple and inexpensive preservative treatment, consisting of equal parts of mercuric chloride, arsenic, and sodium chloride, of which a tablespoonful suffices for each 4-in. post. A life of 15 years has been obtained for Douglas fir [*Pseudotsuga taxifolia*] posts treated with this formula.

Timber preservation.—45 pp., 8 pl., London, Timber Development Association Limited, 1946.

This useful booklet presents the essential information on up-to-date methods of timber preservation, including a list of preservatives of three types, viz., tar-oil, water solution, and organic solvent, a table exemplifying their applicability for different purposes, directions for the preparation of the wood for treatment, methods of application, advice on the prevention of sap stain and the preservation of mining timber, observations on the factors affecting preservative penetration, and an account of the properties and uses of treated timber. Appendix I deals with the permeability of timber to preservatives and II lists some proprietary preparations.

SMITH (K. M.) & MARKHAM (R.). **An insect vector of the Turnip yellow mosaic virus.**—*Nature, Lond.*, clviii, 4012, p. 417, 1946.

In an experiment on the insect transmission of turnip yellow mosaic virus [*R.A.M.*, xxv, p. 284] two insect-proof cubicles in a greenhouse were filled with healthy young turnip and Chinese cabbage and two infected plants were placed in each. In one cubicle a large number of flea-beetles, mostly *Phyllotreta cruciferae* and *P. vittula*, were released, while the other was kept free from insects. Ten days later the first plant became infected, the next day three more, and in the next two days five more. In the control cubicle the virus did not spread. If this result is confirmed, it will be the first example in Great Britain of virus transmission by a biting insect.

MITCHELL (K. J.). **Preliminary note on the use of ammonium molybdate to control whiptail in Cauliflower and Broccoli crops.**—*N.Z. J. Sci. Tech.*, A, xxvii, 4, pp. 287–293, 2 figs., 1945.

'Whiptail' appeared in cauliflower and broccoli crops in North Island, New Zealand, in 1943, causing up to 50 per cent. distortion of growth and a heavy drop in the production of marketable curds. Preliminary experiments indicate that control may be effected by dressings of ammonium molybdate at 20 lb. or less per

acre, while a heavy application (1 ton per acre) of blood and bone manure reduced the incidence of the disorder by 60 per cent. Carbonate of lime (4 tons per acre), applied just before planting out, conferred no apparent benefit, but when 3 cwt. muriate of potash was used in addition there was a considerable, but not significant, reduction in the number of diseased plants [cf. *R.A.M.*, xxiii, p. 55].

Matthews (R. E. F.). **Sugar Beet mosaic in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxvii, 4, pp. 294–302, 7 figs., 1945.

Spontaneous infection by the beet mosaic virus was found on sugar beet and mangels in the Bunnythorpe and Palmerston North districts of New Zealand late in 1940, this being the first record of the disease for the country. The identity of the virus from the diseased plants with the beet mosaic virus was established by comparative symptomatological, transmission, host range, and physical property studies. Inoculation experiments on silver, sugar, and red beets and spinach were successful. Aphids (*Myzus persicae* and *Macrosiphum solanifolii*) are probably the most active agents in the spread of infection in the field, while the virus may also be perpetuated in the biennial silver beet and perpetual spinach crops, as well as in those of seed beet.

Copp (L. G. L.). **Sugar-Beet variety trials.**—*N.Z. J. Sci. Tech.*, A, xxvii, 5, pp. 376–380, 1946.

The results of four years' sugar beet variety trials demonstrated the superiority of Klein E and similar German lines to those of American origin. The latter have been specially selected for resistance to leaf spot (*Cercospora beticola*) and [mosaic] virus infection [see preceding abstract], neither of which is of major importance in New Zealand; hence the indifferent performance of the American varieties in the present series of experiments is readily intelligible. In the United States, under conditions favouring the pathogens in question, the yield relations are reversed.

Watson (Marion A.), Watson (D. J.), & Hull (R.). **Factors affecting the loss of yield of Sugar Beet caused by Beet yellows virus. I. Rate and date of infection; date of sowing and harvesting.**—*J. agric. Sci.*, xxxvi, 3, pp. 151–166, 8 graphs, 1946.

The average yield of sugar beet in Great Britain for 1937, 1938, 1943, and 1944, years of severe outbreaks of beet yellows virus disease [*R.A.M.*, xxv, p. 532] was 8 tons per acre; for other years since 1933 it was 9·6 tons. In 1943, the yield for a part of Lincolnshire where the disease was severe was reduced to 9·4 tons per acre, compared with an average of 11·7, while in other parts of the country, where the disease did not occur, yields above the average were recorded.

In Part I are described experiments carried out in 1941, 1942, 1944, and 1945 to measure the effect on yield and composition of sugar beet caused by artificial infection [ibid., xxii, p. 124] and its relation to the following factors: rate and date of infection, dates of sowing and harvesting, nutrition, and variety. This paper records results for the first four factors which are examined statistically in Part II. The varieties used were Kleinwanzleben E, Cannells 937, and Marsters.

It was not possible to prevent the natural spread of the virus within experimentally infected plots or the introduction of infection from outside sources. As a result, the percentage infection was higher than that expected from the experimental treatments. The observed yields were therefore corrected for accidental infections by means of regression co-efficients.

It then appeared that the reduction in yield of sugar was proportional to the rate of infection, that is, the loss of sugar was proportional to the percentage of diseased plants, a result which may prove useful in forecasting yields prior to harvest. No compensation for this loss was observed by increased growth in adjacent healthy

plants. The effect of infection on yield of sugar decreased linearly with later dates of infection and became almost negligible by harvest time, the loss of yield thus being roughly proportional to the time between the date of infection, as shown by the first symptoms, and that of harvesting. The loss of yield per 1,000 plants per week of infection was estimated at 10 lb. sugar, or 5 per cent. of the yield of healthy plants. Late infections, showing symptoms just before harvest, seemed to increase the yield, but this was considered to be due to the tendency for larger plants to be more liable to natural infection.

Little effect was produced on the loss of yield of sugar in infected plants by variation in the dates of sowing, but as late sowing reduced the yield in comparison with healthy plants this practice increased the percentage loss caused by infection. Late-sown crops were also more susceptible to natural infection. The loss of yield was highest where all plants were infected at the earliest date, at the end of June, and the symptoms appeared in July. In the 1941 and 1942 experiments, respectively, the losses were 36 and 24 cwt. sugar per acre, or 72 and 46 per cent. of the yields of healthy plants.

Variation in the date of harvest produced no significant alteration in the effect of disease, but later harvesting permitted a higher incidence of disease to be attained from late infections. Infections causing symptoms any time between July and early September produced comparable effects on crops gathered in late November or December. Thus, the time of entry of the pathogen into the crop is the main determinant factor in the extent of the effect on yield.

The loss of yield of tops and roots caused by infection was relatively smaller than that of sugar. The sugar content of the root was reduced by 1 to 2 per cent. of fresh weight. In this respect, August infections, showing symptoms in September, exerted rather less effect than those occurring earlier.

While the general conclusion to be drawn from these experiments is that control measures should be directed to the prevention of early infection, there is no known method of doing this. Effective control depends, therefore, rather on eliminating the sources of infection. Early sowing was shown to offer some control by reducing the susceptibility of the crop and was also beneficial in producing an increase in yield, where this had fallen sharply though infection, comparable with that in healthy crops.

The difficulty of forecasting yields in virus-ridden areas might be overcome, and an accurate assessment of disease loss made, by estimating on a number of occasions the rate of crop infection and assuming a constant rate of loss for each week. This requires determinations of the weekly rate of loss in absolute units or as percentage of the yield of healthy plants under a wide range of conditions.

ARK (P. A.) & LEACH (L. D.). **Seed transmission of bacterial blight of Sugar Beet.**—*Phytopathology*, xxxvi, 7, pp. 549–553, 1 fig., 1946.

Phytomonas [*Pseudomonas*] *aptata*, previously known as the agent of a leaf spot of sugar beet, was found in 1943 to be responsible for foliar blight, black streaking of the seed stalks, and internal root necrosis of the same host in California and Oregon [*R.A.M.*, xxiv, p. 173]. Seeds from blighted stalks are heavily contaminated and give rise to diseased plants, but this mode of transmission of the causal organism was controlled in greenhouse tests by new improved ceresan as a dust ($\frac{1}{2}$ oz. per 100 lb. seed) or dip (1 in 1,200) and arasan dust (4 oz. per 100 lb.). Inoculation experiments gave positive results on sugar beet, [chilli] pepper, kidney bean (*Phaseolus vulgaris*), eggplant, lettuce [ibid., iv, p. 252], and nasturtium (*Tropaeolum majus*), all of which had already been found susceptible by Nellie A. Brown and Clara O. Jamieson (*J. agric. Res.*, i, pp. 189–210, 1913; *Science*, xxix, pp. 915–916, 1909), as well as on broad bean (*Vicia faba*) and Swiss chard (*Beta vulgaris* var. *cicla*).

SINGH (U. B.). **Pythium collar-rot of field Pea at Cawnpore, United Provinces.**—*Curr. Sci.*, xv, 7, pp. 195–196, 1946.

A species of *Pythium* isolated from the soft, brown, water-soaked lesions on the collars of wilted pea plants at the Research Farm, Cawnpore, in February, 1946, readily formed antheridia, oogonia, and oospores on potato dextrose agar at 21° to 23° C. The pea has not hitherto been recorded as a host of *Pythium* in India. About a week later patches of similarly affected plants in waterlogged soil yielded the same fungus, occasionally accompanied by a *Fusarium*. Inoculation experiments on pea seedlings with the *Pythium* at 30° to 37° resulted in the development of typical necrotic symptoms from the fifth day onwards, followed by the death of the plants within a fortnight, while the uninfected controls remained healthy. The fungus was re-isolated from the dead plants. At 27° to 32° the *Pythium* formed zoosporangia and zoospores; the mode of emergence of the latter has not yet been observed and further studies are in progress.

HEINTZE (Miss S. G.). **Manganese deficiency in Peas and other crops in relation to the availability of soil manganese.**—*J. agric. Sci.*, xxxvi, 4, pp. 227–238, 2 graphs, 1946.

The author adduces evidence to show that crops sensitive to manganese deficiency are generally healthy on soils with more than 0·3 mg. per cent. exchangeable manganese, though they may be healthy on soils with less. In crops on fen and other soils manganese deficiency occurred where low exchangeable manganese and high nitrifiable nitrogen occurred together.

Pot tests demonstrated that the control of pea marsh spot [*R.A.M.*, xxiv, p. 173] required adequate manganese throughout seed formation, manganese accumulated in the plant before flowering being ineffective. Marsh spot was induced in peas in a soil rich in available manganese by the injection of simple inorganic and organic nitrogen compounds into the plant. In field tests, manganese sulphate and basic slag applied to marsh soils before sowing peas reduced marsh spot, but not enough to justify the use of these materials on soils which quickly oxidize manganous compounds. Laboratory and pot culture tests support the practical recommendation of late sprayings with manganese salts on such soils [cf. ibid., xix, p. 187].

HEDGES (FLORENCE). **Experiments on the overwintering in the soil of bacteria causing leaf and pod spots of Snap and Lima Beans.**—*Phytopathology*, xxxvi, 8, pp. 677–678, 1946.

When snap beans (*Phaseolus vulgaris*) or Lima beans (*P. lunatus* var. *macrocarpus*) were grown in soil where the previous year's crop had been heavily infected with *Pseudomonas medicaginis* var. *phaseolicola*, or in soil composted with plant material from the previous year's crops infected with this organism and *Xanthomonas phaseoli* or with *P. syringae*, no infection resulted. Overwintered infected material used as spray inoculum likewise failed to induce infection the following year [cf. *R.A.M.*, xxv, p. 89].

ZAUMEYER (W. J.). **Field control of Bean rust with sulfur.**—Abs. in *Phytopathology*, xxxvi, 8, p. 689, 1946.

Notwithstanding environmental conditions in the broad bean [*Vicia faba*] growing areas of Colorado, Wyoming, and Montana, which were ideal for the development of rust [*Uromyces fabae*] in 1945, excellent control was obtained by sulphur-dusting at 20 to 25 lb. per acre. Control early in the season, when infection is usually sparse, is relatively simple and prevents a secondary spread. One dusting applied by most growers in early July before the plants covered the rows practically eliminated the disease at Greely, Colorado. Fields dusted twice showed an average yield of 1,600 to 1,800 lb. seed per acre as against 800 to 1,000 lb. in untreated

fields. At Bridger, Montana, where rust was widely prevalent, an average of 2,000 lb. clean seed per acre was obtained over a twice-dusted area of 330 acres, the highest yield being 2,369 lb. Once-dusted fields averaged 1,400 and undusted 1,016 lb. per acre, the poorest being 380.

Frazier (N. W.) & Freitag (J. H.). **Ten additional leafhopper vectors of the virus causing Pierce's disease of Grapes.**—*Phytopathology*, xxxvi, 8, pp. 634–637, 1946.

Ten additional species of leafhopper were shown experimentally to be vectors of the virus of Pierce's disease of vine [*R.A.M.*, xxv, p. 437], viz., *Carneocephala triguttata*, *Neokolla gothica*, *N. confluens*, *N. hieroglyphica*, *Cuerna occidentalis*, *Pagaronia triunata*, *P. 13-punctata*, *P. furcata*, *P. confusa*, and *Friscanua friscanus*. None of these appears to be of any importance in the field in spreading the virus to lucerne. All 14 vectors which have been demonstrated to transmit Pierce's disease virus are in the family Tettigoniellinae, of which every species so far tested has transmitted the virus. Of over 50 leafhopper species of other subfamilies none has been shown to be a vector.

Le Roux (M. S.). **Sunscald in table Grapes.**—*Fmg S. Afr.*, xxi, 245, pp. 506–510, 1 fig., 1 graph, 1946.

Observations made in a vineyard at Groot Drakenstein, western Cape Province, on the incidence of sunscald among 15 of the most important export varieties of grapes (all grafted on Jacquez rootstocks), each trained on four types of trellis system, showed that the percentage of sunscald ranged from 0·3 (Barlinka) to 33·6 (White Prince), though all the varieties had been given similar treatment for factors likely to influence sunscald (e.g., identical irrigation, sulphuring, and cultivation). The berries are most sensitive just before they attain their full size and until they begin to change colour. On the whole, the white and red varieties proved more susceptible than the black. Taking an average of the amount of sunscald present in three varieties for each system of trellising, on the low perold there was 37 per cent. sunscald, on the fish-spine 28 per cent., on the high perold 18 per cent., and on the slanting trellis 17 per cent. The higher percentage on the fish-spine as compared with high perold, which is of the same height, is attributed to the fact that in the former system the wires are all at the same height, with the result that the grapes hang free of the leaves, bunches on the outside often encountering the direct rays of the sun. The trellis affording the best protection is the slanting, 4 ft. 6 in. high, in spite of the fact that the grapes also hang free and that the trellis lies at an angle of 30° to the afternoon sun. The protection is ascribable to the breadth of the trellis, which is 5 ft., and to the fact that the vines can be pruned in such a way that the crop is not borne on the sides.

Growers are advised to give preference to the less sensitive varieties, such as Alphonse Lavallée and Waltham Cross, and to avoid White Prince, Flaming Tokay, Raisin Blanc, Almeira, and Prune de Cazouls, particularly in regions farther inland, e.g., Hex River, where humidity is low and sunscald common. If sensitive varieties are grown, trellises should be wide and reasonably high, and if there is still danger, they should run from east to west. Sulphur dusting, if applied at all during the hot days just before the grapes begin to soften or change colour, should be as light and even as possible. The grapes should also be kept free from dust. The fruit should be accustomed to strong light gradually, by starting to sucker and thin out the leaves in good time. Care must be used in exposing the branches, especially after a cool, early summer. The bloom should be protected against unnecessary rubbing. When the crop is thinned out, it is preferable to remove the bunches on the outside of the trellis which hang lowest. Ventilation should be adequate, and the vineyard must be kept moist.

Kemp (H. K.). **Grape Vine little leaf and its control.**—*J. Dep. Agric. S. Aust.*, l, 1, pp. 3–5, 2 figs., 1946.

Vine little leaf [*R.A.M.*, xxiii, p. 491] occurs over large areas of the irrigated and non-irrigated parts of South Australia. It has often been confused with court-noué, but in every case where zinc treatment [ibid., xxiv, pp. 7, 353] has been applied, rapid recovery has taken place. In the Barossa Valley zinc winter swab treatment in 1944 resulted in a 25 per cent. increase in one vineyard but in another in 1946 it had no effect. In the Morphett Vale district, although little leaf disappeared during the first season after treatment, no crop increase occurred until the second year. It is considered that there is no vine district in the State which may not be expected to respond to zinc treatment, and it is pointed out that the Grenache variety develops acute zinc deficiency before showing any symptoms. On spur-pruned vines the zinc swab (water 1 gal., agricultural zinc sulphate 2 lb., rhodamine R.D. or any other dye to colour) should be applied immediately after pruning. On rod-pruned vines the much less effective zinc foliage spray (zinc sulphate 5 lb., hydrated lime 3 lb., water 100 gals.) must be applied. Severely affected vines will probably require annual treatment, but tests are to be made to investigate this and also the injection method of treatment.

Morquer (R.). **Sur quelques Fusarium dans l'écoulement muqueux de la Vigne au printemps.** [On some *Fusarium* species found in the mucous exudate of the Vine in spring.]—*Bull. Soc. Hist. nat. Toulouse*, lxxv, pp. 193–208, 1940. [Abs. in *Rev. Bot. appl.*, xxii, 249–250, pp. 325–326, 1942. Received October, 1946.]

Several species of *Fusarium*, including *F. merismoides* and *F. avenaceum*, are able to vegetate abundantly and reproduce in the mucous exudate of vines in spring [*R.A.M.*, v, p. 593]. *F. merismoides* is reported for the first time from the vicinity of Toulouse taking part in the formation of mucilaginous masses growing on vine stems. The fungus obtains its nutriment from the sap that flows from wounds of all kinds. Attempts at artificial infection indicated that the fungus lives only as a saprophyte in the vine sap.

Boixo (Baron de). **Soufrages en 1945.** [Sulphur treatments in 1945.]—*Progr. agric. vitic.*, cxxv, 22–23, pp. 368–370, 1946.

Dusting tests against *Oidium* [*Uncinula necator*] carried out in the author's vineyard, Cuxous, France, in 1945 demonstrated that Narbonne sulphur containing 16 to 30 per cent. pure sulphur is entirely effective [*R.A.M.*, xxv, p. 490] and that yellow sulphur with 50 per cent. lime is as effective as pure sulphur.

Arnaud (G.). **La valeur pratique des essais d'anticryptogamiques viticoles.** [The practical value of tests with fungicides for use on Vines.]—*Prog. agric. vitic.*, cxxvi, 33–34, pp. 97–99, 1946.

In estimating the value of any treatment recommended for the control of vine diseases the cost of the materials and labour must be borne in mind. While laboratory tests of fungicides must be followed by field tests before a final recommendation can be made, the fact must not be overlooked that some field tests are made under conditions that have little bearing on everyday vineyard practice.

If a comparative test is made of different active products used against mildew [*Plasmopara viticola*] or if different concentrations of Bordeaux mixture are used, it will be found that the differences in effectiveness between these materials vary with the circumstances. The same applies when pure sulphur or sulphur mixed with different proportions of inert matter is used against *Oidium* [*Uncinula necator*]. As a general rule, the difference in relative effectiveness between poor, moderately good, and very good materials diminishes when conditions favour the fungus.

Further, such differences can become almost nil when conditions are optimum for the materials.

Conditions that favour the fungicide are: poor development of the parasite, owing to climatic factors or varietal resistance in the host, great care in application, the use of large quantities of the material, the training of the vines on palisades permitting better spray coverage, and the use of sprayers carried on the backs of the workmen. Factors which, on the other hand, accentuate the differences between the given products are: weather conditions favouring the parasite, the use of susceptible varieties, vines not trained on palisades, the use of large-scale spraying machinery, etc.

Final tests of fungicides for use on vines should be made under conditions of ordinary everyday vineyard practice, on vines cultivated in the usual way, and with the costs of material and labour strictly limited to what the grower can afford. The experiments should also be carried out by competent persons.

Heterogenesis and the origin of viruses.—*Nature, Lond.*, clviii, 4012, pp. 406–407, 1946.

During a discussion on the origin of viruses at a meeting of the Society for General Microbiology held at Leeds on 23rd July, 1946, the general concensus of opinion was that plant, animal, and bacterial viruses (bacteriophages) should be considered independently. F. C. Bawden, while apparently inclining to the heterogeneric view, pointed out that though virus-like proteins might be normal constituents of some plants, our methods of detecting them are as yet imperfect.

Trotter (A.). **Rassegna delle consultazioni e della attività della Sez. di Patologia vegetale dell' Osservatorio di Portici (Ist. di ricerca e speriment. scient. per la fitopatologia) a tutto il 1942.** [Review of the consultations given by and the activities of the plant pathological section of the Portici Observatory (Institute of Scientific Research and Experimentation in Phytopathology) up to 1942, inclusive.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno (Portici)*, x, pp. 1–64, 6 pl., 6 figs., 1946.

This report, which covers the years 1918 to 1942, inclusive, and is the first to be issued on the activities of phytopathological section of the Portici Observatory, summarizes the diseases recorded in Italy during that period, some of which have already been noticed from other sources.

Dastur (J. F.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst. New Delhi, 1944–5*, pp. 66–72, 1946.

Of the 82 wheat varieties tested during the period under review [cf. *R.A.M.*, xxii, p. 196] for their reaction to loose smut (*Ustilago tritici*) [ibid., xxv, p. 495], 39 did not contract infection and 26 were only mildly attacked. Of a further 39 submitted for trial by breeding specialists, 10 remained free from infection, while 10 others sustained only slight damage. Tests with *U. tritici* on a set of Indian wheats suggested the presence of two physiologic races in India, but tests carried out in Canada pointed to only one; further studies are planned.

The incidence of Karnal bunt of wheat (*Neovossia indica*) [ibid., xxiv, p. 224] was very low. Further experiments confirmed previous observations as to the aerial transmission of infection.

Of 28 pigeon pea (*Cajanus cajan*) varieties tested for their reactions to *Fusarium udum* [ibid., xx, p. 496], IP80 was immune, IP41 and Hybrid 5 (D419-2-4) showed up to 5 per cent. infection, and the rest were highly susceptible to the wilt. In an infested field plot IP80 developed 4 per cent. infection, C.15, A126-4-1, and Thadgam 1-4-7 up to 7 per cent., IP41, 12 per cent., and three others were highly susceptible.

The tubers of 40 potato varieties were tested for their response to infection by *F. solani*, the agent of a severe rot. Complete immunity after a month's exposure to attack under optimum conditions for the pathogen was exhibited by cult. 296, and 394, Aya Papa, and MO9, while only 5 per cent. infection developed in cult. 230, Hyb. 2, 9, 11, and 14, and JO7, the remainder being highly susceptible.

Potato virus A was isolated from the Phulwa and Darjeeling Red Round varieties and its identity established by the reactions it induced on the differential hosts [cf. ibid., xxv, p. 413]. The presence of *Solanum* viruses 1 and 2 [potato viruses X and Y] in combination in the President, Up-to-Date, and Epicure varieties was disclosed by the reactions of differential hosts to inoculation with juice from the diseased plants.

The epidemic of sugar-cane red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*] is reported to have been effectively combated in the United Provinces and Bihar. Recent experiments have again demonstrated the transmissibility of infection on a considerable scale through contaminated soil and irrigation water, the nodal regions of the host being the most liable to attack; the fungus was found to survive for about six months in fallow land.

In 32 isolates out of 390 platings of diseased rice samples the spore measurements agreed with those of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*].

WILLIAMS (R. O.). **Annual Report on the Department of Agriculture, Zanzibar Protectorate, 1945.**—27 pp., 1946.

In further work on 'sudden death' of cloves in Zanzibar [*R.A.M.*, xxv, p. 100] intercropping has already produced a great improvement in the young trees, which have shown good growth and are now the bushy shape characteristic of good health. Measurements of clove trees growing under various nurse crops and shade trees confirmed earlier observations that those under banana and *Gliricidia* are the most vigorous and healthy. Spectrographic analyses of leaf samples from affected trees carried out at Long Ashton indicated the presence of manganese in quantities which would be toxic in England, while the phosphorus and calcium content was below the normal health limit. Other factors do not entirely support the view that any of these elements is the cause of the condition, but further investigations are being made on this point.

Scab [*Elsinoe fawcetti*] was serious on rough lemon stocks, but spraying with Bordeaux mixture gave some control. Premature fruit-fall in two citrus orchards was found to be due to *Alternaria citri*. Large areas of paddy rice were attacked by leaf spot due to *Helminthosporium* [? *oryzae*: ? *Ophiobolus miyabeanus*].

Report of the Director for the year ending 31st October, 1944.—*Bull. Conn. agric. Exp. Sta.* 484, pp. 68–71, 1945.

The most promising method for the control of Dutch elm disease [*Ceratostomella ulmi*] and *Verticillium* wilt of elm and maple [*Acer* spp.] appeared from the four years' investigations summarized in this report [cf. *R.A.M.*, xxiv, p. 220] to be internal chemotherapy [ibid., xxiii, p. 367]. It was ascertained that the fungal toxin responsible for the chief symptoms of Dutch elm disease may be inactivated by such chemicals as 8-hydroxyquinoline sulphate; that pre-infection treatments with materials such as 8-hydroxyquinoline benzoate may confer some resistance; and that post-infection treatments promptly applied may cure the condition. Other evidence showed that the removal of infected wood may be valuable in saving individual trees. Cankerworm [*Alsophila pometaria*] defoliation conspicuously increased the summer-time susceptibility of elms to fungal infection.

Fungicidal studies indicated that plants can be 'immunized' against certain diseases by watering the soil with dithane [ibid., xxiv, p. 220; xxv, p. 215]. It has been shown that chemicals to be used as fungicides can be selected on a basis

of their ability to inhibit the action of certain cell components, such as amines, amino acids, metals, sugars, etc.

When seedling peaches were injected by the top injection method with various chemicals before and after inoculation with the X-disease virus [ibid., xxv, p. 37] by budding, the results confirmed those of earlier experiments, showing that immunization resulted from the administration of *p*-aminobenzene sulphanilamide and that injury to the tree by this chemical was to some extent prevented by the addition of a 2 per cent. solution of maltose or dextrose. Injections after inoculation gave 100 per cent. control. Hydroquinone, zinc sulphate, dextrose, and maltose each gave some control. Dithane sprays gave good control of apple scab [*Venturia inaequalis*] at 4 and 2 lb. per 100 gals. in the early part of the season, but lost its effectiveness later, while higher dosages produced severe foliar injury. When zinc sulphate and lime were added, the efficiency was increased and injuriousness reduced. Thiosan [ibid., xxiii, p. 236] remained effective against scab throughout the season, its efficiency being enhanced by the addition of lead arsenate.

Studies on calcium and potassium nutrition in relation to potato scab [*Actinomyces scabies*] and cabbage club root [*Plasmodiophora brassicae*] showed that, as the ratio of available calcium to available potassium in the soil was shifted progressively from high calcium to high potassium, the response of both diseases was not a simple relationship but of a periodic nature.

Field tests on plant decomposition products confirmed the results of greenhouse experiments. Five plant products used as mulches on strawberries in a poorly drained soil varied in their harmful effects as measured by the incidence of black root [cf. ibid., xvi, pp. 518, 623; xx, p. 348], number of surviving plants, and weight and number of berries produced. Limited greenhouse tests with green manures incorporated in the soil indicated that some grasses, e.g., timothy [*Phleum pratense*], are more apt to produce toxins than certain non-graminicolous species, as measured by the incidence of black-root symptoms. Squash foot rot [unspecified] appears to be declining in Connecticut, probably because seedsmen have now realized that seed infection dies out during two years' storage and because the fungus has been unable to thrive in the soil during the drought conditions that have recently prevailed. Squash seed can be freed from the fungus by hot-water treatment, but two years' storage is more practicable.

The form of seedling damping-off prevalent in Connecticut is mostly due to *Pythium debaryanum*. An outbreak in 1944 was the worst experienced in 11 years. Experimental evidence showed that good results followed when the soil was sprinkled with formalin (1 pint per gal. water per 15 sq. yds.) while being raked over just before seeding. Well mixed in the top soil, this was as effective as formaldehyde dust, and much easier to apply. Seed treatment was rather less effective, the best results being given by fermate, followed (in order) by cuprocide, arasan, thiosan, and semesan. No reduction of germination followed the treatment, and the resultant control was commercially satisfactory, though not always complete.

Fifty-eighth Annual Report of the Kentucky Agricultural Experiment Station for the year 1945.—68 pp., 1946.

In this report [cf. *R.A.M.*, xxiv, p. 403] it is stated that the tobacco variety Ky 33 is resistant to *Fusarium* wilt [*F. oxysporum* var. *nicotianae*] and black root rot [*Thielaviopsis basicola*], while Ky 34 is resistant to both and to mosaic. The F_2 progeny of a cross between the two were also resistant to *F. oxysporum* var. *nicotianae*, and some had excellent plant characters. Further selections are being made. F_3 hybrids between Barnett, Ky 33, and Ky 34 show high resistance to *Fusarium* wilt, excellent plant characters, and resistance to mosaic [ibid., xxv, p. 423].

The tobacco-streak virus [ibid., xxii, p. 375; xxv, pp. 238, 369] was transferred by inoculation to tobacco from sweet clover [*Melilotus*] plants from roadsides in Harrison county and from the Experiment Station farm. There is no doubt, therefore, that sweet clover is a natural host of the virus. In transmission experiments with 70 selections and varieties of tobacco, slight differences in resistance were noted.

In further work with the 32 isolates of *Cercospora* [? *nicotianae*: ibid., xxiv, p. 404], infection and sporulation occurred on tobacco inoculated with the fungus from tobacco, lupin, *Petunia*, and pokeweed [*Phytolacca decandra*], but not when isolates from 11 other species were used. Infection and sporulation also occurred on beans [*Phaseolus vulgaris*] with isolates of the fungus from 27 other species and on beet, *Petunia*, pansy, cabbage, and cantaloupe with isolates from 6, 8, 9, 12, and 6 other species, respectively.

During the early part of the season, Burley tobacco was severely injured by brown root rot [ibid., xxiv, p. 405]. Most of the plants made good growth later, but yield and quality of the leaf were greatly reduced on some plots. The wide prevalence and severity of the condition are attributed to a cool, wet spring. The extent and severity of the disease did not appear to be associated with any particular grass or grass-legume combination or with the available fertility level. The disease was absent from or slight on fertile plots previously under bluegrass [*Poa annua* and *P. pratensis*]—white clover [*Trifolium repens*] for over 40 years and in tobacco grown either in two-year rotation or continuously.

Black root rot, as a result of the cool, wet spring and early summer, was exceptionally prevalent, and was very injurious to susceptible varieties of Burley tobacco. The resistant Ky 16 and Ky 41 A were slightly retarded, but gave a good yield.

No satisfactory variety of either Burley or dark tobacco carrying the Ambalema factor for mosaic resistance [cf. ibid., xxiii, p. 192; xxv, p. 283] has been developed yet at the Experiment Station. Three satisfactory varieties containing the N factor, Ky 150, Ky 151, and Ky 160, are being grown successfully by farmers.

Phloem necrosis continued to kill elms in ever-increasing numbers [ibid., xxiv, p. 436]. Dutch elm disease [*Ceratostomella ulmi*] was observed on two trees in Campbell county. Limited surveys along the Kentucky side of the Ohio river as far west as Henderson county revealed no further infections in that area, though *C. ulmi* appeared to be rather prevalent across the river in Ohio.

RUDD JONES (D.). **A medium for investigating the breakdown of pectin by bacteria.**—*Nature, Lond.*, clviii, 4018, p. 625, 1946.

During an investigation on bacteria associated with rotting of potatoes in storage a new method of testing isolates for ability to break down pectin was devised. A sodium pectate powder forming a gel at a neutral pH and in the absence of sugar was obtained, and a medium prepared as follows: a basal solution was made containing 1 gm. ammonium acid phosphate, 0·2 gm. potassium chloride, and 0·2 gm. magnesium sulphate per l. distilled water with 50 ml. per l. of McIlvaines's phosphate (0·2 M)-citrate (0·1 M) buffer solution. The mixture was heated to 70° C. and sufficient of the sodium pectate added to give a 1 per cent. concentration. It was then raised nearly to boiling-point and kept at this temperature for about five minutes, being stirred meantime. Bromo thymol-blue was added as an indicator. The medium was then tubed and sterilized by raising it momentarily to 120° and allowing to cool. Setting was induced by calcium ions (approximately 3·2 per cent. of the powder), which converted some of the sodium pectate to calcium pectate on cooling. The addition of a small proportion of a 10 per cent. solution of calcium chloride increased the structural viscosity.

Tubes inoculated by needle stabs from broth cultures of *Bacterium phytophthorum* [*Erwinia phytophthora*], *Bact. carotovorum* [*E. carotovora*], *Bact.* [*E.*] *aroideae*, and *Bacillus polymyxa* [*R.A.M.*, xxii, p. 493] showed slight liquefaction after two days at 25°, liquefaction being almost complete after a week. *Pseudomonas fluorescens* did not liquefy the medium after 20 days. *Botrytis cinerea* and *Sclerotinia minor* also produced liquefaction. Evidence was obtained that liquefaction of a pectate gel and loss of coherence in plant tissue appear to be correlated.

BAKER (R. E. D.). **Cacao virus diseases.**—*Proc. agric. Soc. Trin. Tob.*, xlv, 4, pp. 289, 291–294, 1945.

After referring to the discovery by Posnette of cacao red mottle and vein-clearing in Trinidad in 1943 [*R.A.M.*, xxv, p. 296] the author states that the disease still appears to be confined to the north-western part of the island, particularly the valleys of Maracas, Santa Cruz, and Diego Martin. Visits to eastern Venezuela, Tobago, Grenada, St. Vincent, and Dominica indicated that these localities are probably unaffected. The chief symptoms are leaf mosaic and pod and leaf red mottle, but in a mixed seedling population such as is found in most Trinidad cacao fields the symptoms vary from tree to tree, and in vegetatively propagated material from clone to clone. There is reason to believe that two strains of the disease occur, differing slightly in their symptoms on different clones; both appear to be present in the Santa Cruz valley, one only (A) at Diego Martin, the other (B) only in Maracas. The symptoms indicate that these strains resemble certain strains of cacao virus found in West Africa but are not identical with them. The symptoms are not always constant or reliable, a tree known to be infected sometimes producing a flush without symptoms. Spread is slow, new outbreaks occurring at short distances only. The disease damages the trees and significantly reduces yield, and the wholesale eradication of the condition at an early date is advised.

THOROLD (C. A.). **Cacao virus disease.**—*Proc. agric. Soc. Trin. Tob.*, xlv, 4, pp. 295, 297–299, 1945.

To attempt the eradication of cacao virus disease from Trinidad [see preceding abstract] provision has been made for an intensive survey to be carried out by a staff of inspectors who will have the right of entry to estates and power to destroy trees where necessary. At the start, no tree will be destroyed without reference to the Plant Pathologist. All nursery trees at La Pastora Propagating Station were examined, and none was found to be affected. Of 10,193 trees examined in the Santa Cruz valley during ten days' inspection, 534, or about 5 per cent., were affected, the figures on the different properties ranging from 0 to 31 per cent.

SPRAGUE (R.). **Rootrots and leafspots of grains and grasses in the northern Great Plains and western States.**—*Plant Dis. Reptr, Suppl.* 163, 267 pp., 1946. [Mimeographed.]

This copiously annotated compilation includes references to some 220 species and subdivisions of species of parasitic fungi found growing naturally on Gramineae in the northern Great Plains and western States of the American Union [*R.A.M.*, xxiv, p. 221; xxv, p. 345], as well as to a few disorders of indeterminate or non-parasitic origin. The fungi comprise 13 Phycomycetes, 24 Ascomycetes, 8 Basidiomycetes, and 162 Fungi Imperfecti, and under each fungus brief summaries are given of the symptoms, host range, sometimes morphology, and less often of taxonomy. A bibliography of 782 titles and host and fungus indices are appended.

Oort (A. J. P.). **Is de Berberis een gevaar voor de Graancultuur?** [Is the *Berberis* a threat to cereal cultivation?]—*Tijdschr. PlZiekt.*, xlvii, 3, pp. 112–119, 1 pl., 1941. [Received November, 1946.]

In 1940 wheat black rust (*Puccinia graminis*) developed prematurely and with exceptional severity in Holland, where little is known concerning the occurrence of the disease in previous years and a more intensive study is desirable. In many places there was an obvious connexion between the rust outbreaks and proximity to the crops of the susceptible common barberry, the eradication of which may well assume considerable local importance as a control measure. Since some of the ornamental barberries, e.g., *Berberis thunbergii*, are immune [*R.A.M.*, xvii, pp. 102, 603, *et passim*], a revision of the species cultivated in parks and gardens should be undertaken, paying attention to their reactions to black rust.

Johnson (T.) & Newton (Margaret). **The occurrence of new strains of Puccinia triticina in Canada and their bearing on varietal reaction.**—*Sci. Agric.*, xxvi, 9, pp. 468–478, 1 fig., 1946.

Strains of leaf [brown] rust (*Puccinia triticina*) have been found in Canada which are able to cause heavy infection of Regent wheat and other varieties usually displaying high resistance to this rust [cf. *R.A.M.*, xxiv, p. 495]. Some of these strains are biotypes of known races, such as 5 and 15 [ibid., xxii, p. 199], but the one most commonly present is 128, which closely resembles 29, but differs from it in its ability to infect Regent, Renown, and Redman severely in the adult stage. It was first identified in Canada in 1944, when it comprised 12 per cent. of all brown-rust isolates, increasing in 1945 to 26 per cent. and representing 66 per cent. of those from Regent, Renown, and Coronation.

The new strains that appear to have overcome the resistance of Regent have not affected that of K–33, Chinese × Marquis, or Warden × Hybrid English W 325. Hybrids from the cross between the hybrid McMurachy × (Warden × Hybrid English W 325) and Redman showed rather marked resistance to all the brown-rust races with which they were tested, including strains of the rust able to infect Regent and Redman severely. The South American varieties Frontana, Fronteira, and La Prevision 25 were also highly resistant to the 13 strains of brown rust used.

Lejeune (A. J.). **Correlated inheritance of stem rust reaction, nitrogen content of grain and kernel weight in a Barley cross.**—*Sci. Agric.*, xxvi, 5, pp. 198–211, 2 pl., 4 graphs, 1946.

In breeding work at the University of Manitoba for the production of a smooth-awned barley variety of good malting quality resistant to stem [black] rust (*Puccinia graminis tritici*) [cf. *R.A.M.*, xxv, pp. 259, 552] it was found that in the cross O.A.C. 21 × Chevron inheritance of black-rust reaction was governed by a single factor pair with resistance dominant. This factor is thought to be probably the same as that found in Peatland [ibid., xii, p. 753]. Nitrogen-content inheritance was governed by multiple factors, and a definite tendency was observed for nitrogen content in the F_3 progeny to be higher than that of the parents genetically comparable for the black-rust factor. Inheritance of kernel weight was also governed by multiple factors, with a definite tendency towards lower kernel weight in the F_3 progeny than in the parents. Few, if any, of the factors for nitrogen content were linked with black-rust reaction, though some of them appeared to be associated with it indirectly through its relation to kernel weight, resulting in a weak association of high nitrogen content and rust resistance. A large proportion of the factors for 1,000-kernel weight appeared to be fairly closely linked with black-rust reaction, resistance being associated with low kernel weight; when a much larger population was used, however, this linkage was broken. Therefore in similar breeding programmes it would be necessary to use large populations.

Grasso (V.). **First contribution to the study of Wheat bunt in Italy.**—*Int. Bull. Pl. Prot.*, xx, 7–8, pp. 66M–68M, 2 figs., 1946.

After pointing out that wheat bunt in Italy is caused by *Tilletia foetens* [*T. foetida*] and *T. tritici* [*T. caries*], the author states that the latter species was prevalent in the north [cf. *R.A.M.*, xxii, p. 14], whereas in specimens from the centre and south 98 per cent. of the infection was due to *T. foetida*, and scarcely 2 per cent. to *T. caries*. These percentages were the same for all localities and for all of the infected varieties examined, i.e., Mentana, Roma, and Frassineto. Both smut species were found in nature at the same time on the same caryopsis, irrespective of the locality and of the variety of wheat affected. The finding of partially infected grains with spores inside between the pericarp and endosperm indicates that a new method of treating wheat against bunt will have to be adopted, to control the fungus inside as well as outside the grain.

Sempio (C.). **Metabolism of the Wheat—Erysiphe graminis 'complex'.**—*Int. Bull. Pl. Prot.*, xx, 7–8, pp. 49M–65M, 2 figs., 5 graphs, 1946.

Studies are described on the rate of respiration, glycolysis, transpiration, and photosynthesis of wheat of three varieties affected by *Erysiphe graminis* during the full cycle of the disease. For measuring respiration and glycolysis Warburg's method was used, for transpiration the ratio between fresh and dry weight was compared in both healthy and affected plants, while for photosynthesis the author devised a method based on the amount of carbon dioxide fixed by the green tissues.

The results showed that in infected plants respiration was at first slightly higher than in healthy ones, and rose rapidly, reaching a maximum (sometimes four times the normal rate) as the conidia formed. It then declined somewhat as the disease approached its termination, but remained well above normal. During the two or three days after inoculation photosynthesis was stimulated; during the expansion of the mycelium it fell usually below that of the healthy controls, rising above normal during conidial formation and finally falling to values less than half those for healthy plants. Glycolysis was appreciably stimulated during the early stages of incubation; it then fell below normal, this difference increasing progressively as the disease advanced. Transpiration was at first normal, but towards the third or fourth day it increased, and remained high. The possible significance of these results is discussed in detail.

Garrett (S. D.). **Reduction of take-all by artificial fertilizers.**—*J. Minist. Agric.*, liii, 5, pp. 223–225, 1946.

The author briefly adduces evidence obtained by various workers in different parts of the world showing that loss in yield of cereals caused by *Ophiobolus graminis* [*R.A.M.*, xxv, p. 338] decreases with increase in soil fertility. The free use of fertilizers is urged to minimize the risks attendant upon intensive and continuous cereal cultivation, but at the same time it is emphasized that the only lasting and satisfactory method of controlling *O. graminis* (and also *Cercosporella herpotrichoides*) is sound rotation. Other methods of controlling take-all, such as the preparation of a firm seed-bed, care in the use of lime, and proper control of carrier weeds, should not be neglected.

James (N.), Wilson (Joyce), & Stark (E.). **The microflora of stored Wheat.**—*Canad. J. Res.*, Sect. C, xxiv, 5, pp. 224–233, 6 graphs, 1946.

Examination of four grades of Manitoba Northern red spring and No. 5 and No. 6 wheats delivered to the Winnipeg market in 1943 and 1945 disclosed a considerable number of micro-organisms. They were not found on all kernels, but were present in all the 10-gm. samples tested. The high-grade No. 1 Manitoba

Northern showed the lightest infestation which became progressively greater on each lower grade of wheat. The numbers of organisms per gm. of seed were: bacteria 280,000 to 164,000,000, yeasts 6,200 to 64,000, and fungi 420 to 1,870.

One of the two principal contaminants was identified as *Bacterium herbicola aureum* [? *Pseudomonas trifolii*] and the other as a species of *Pseudomonas*, differing from *P. fluorescens* in its strong tendency to slime formation, its lack of colour on nutrient agar, gelatine, or broth, and its inability to reduce nitrates or to form acid from dextrose.

In selections of fungus colonies from a large number of plates made from the first washings *Penicillium* spp. predominated, with *P. chrysogenum*, *P. frequentans*, and *P. terrestre* most frequently noted; species of *Aspergillus*, *Alternaria*, *Fusarium* [*R.A.M.*, xxiv, p. 143], and *Cladosporium* also accounted for a considerable proportion of the colonies. The following in addition were identified: *A. tenuis*, *Acrostalagmus cinnabarinus*, *Aspergillus candidus*, *A. flavus*, *A. fumigatus*, *A. glaucus*, *A. niger*, *A. oryzae*, *A. versicolor*, *Botrytis cinerea*, *Cephalosporium curtipes* and other *C.* spp., *Cephalothecium* [*Trichothecium*] *roseum*, *Cladosporium herbarum*, *F. culmorum*, *F. poae*, *F. scirpi* var. *acuminatum*, *F. semitectum* var. *majus*, *Helminthosporium sativum*, *Hormodendrum pallidum*, *H. viride*, *Monilia* spp., *Mucor circinelloides*, *M. racemosus*, *Paecilomyces varioti*, *Penicillium flavidorsum*, *P. purpurogenum*, *P. rugulosum*, *P. spinulosum*, *Phoma* spp., *Rhizopus* spp., *Scopulariopsis brevicaulis*, *Septoria nodorum* [ibid., xxiv, p. 222], *Torula* spp., and *Trichoderma lignorum* [*T. viride*].

All except *Trichothecium roseum*, *S. nodorum*, *F. semitectum*, *A. oryzae*, and the *A. glaucus* group of the above species have been isolated from Manitoba soils [ibid., xiv, p. 791], and *Alternaria tenuis*, *Aspergillus niger*, *T. roseum*, *C. herbarum*, *F. culmorum*, *H. sativum*, and *S. nodorum* are listed in Orton's bibliography of seed-borne parasites [ibid., xi, p. 386].

The bacteria cannot be regarded as mere chance contaminants, but must be types that develop on the grain, as they are present on a sufficiently large number to account for the enormous population on all the samples studied. It is also clear that their presence is not due to any defect in the grain, and they must be considered as commensals developing on the seed coat or in its intercellular spaces. They must be able to proliferate under the conditions of grain storage or, at least. to withstand such an atmosphere for long periods.

As epiphytic yeasts were found in relatively small numbers, fluctuating errati cally from one sample to another, they are probably of little practical importance. The rest of the fungal population can hardly be regarded as epiphytic. The fact that it is small at the moisture level of stored wheat appears to indicate that it is not the result of multiplication. It is, however, persistent, which probably means that spores are held mechanically and protected in creases or crevices. In general, it represents species that occur commonly in soil and dust in large numbers.

Storage of bulk Wheat grain in ventilated bins.—*J. Minist. Agric.*, liii, 5, pp. 199–201, 1946.

Experimental evidence showed that when air was blown through a bin from inverted troughs at the base at the rate of 20 cu. ft. per minute per ton of stored wheat grain, grain with 20 per cent. water content remained cool and free from visual damage for a fortnight, while grain of 26 per cent. water content was kept safely for two or three days by periodic ventilation. Grain in a moist condition, though kept cool in this way, was gradually attacked by mould [unspecified], and its germination impaired. The amount of air required depended on the difference between grain and air temperatures and on the relative humidity of the air. Under average atmospheric conditions, with a reasonable depth of grain and as high a velocity as is practicable, it was found, however, that grain of 20 per cent. water content could

not be stored without some deterioration, and was not dried to a safe level. It is concluded that pre-storage ventilation with atmospheric air is suitable only for grain of 17 per cent. or less water content. As combine-harvested grain usually has a higher water content, cold air ventilation cannot be relied on to obviate the use of a drier.

In another experiment a bin of wheat was treated successfully by passing through it air raised 8° to 16° F. above air temperature, at the rate of 45 cu. ft. per minute per ton. The water content of the grain was reduced from 19·5 to 15 per cent. in 14 days with no sign of deterioration. This experiment is to be repeated on a farm scale.

KUNKEL (L. O.). **Leafhopper transmission of Corn stunt.**—*Proc. nat. Acad. Sci., Wash.*, xxxii, 9, pp. 246–247, 1946.

In attempts to transmit the new maize disease recently recorded from California and Texas [*R.A.M.*, xxiv, p. 498], and which the author designates 'stunt', 14 healthy plants of the variety Golden Bantam were exposed for four days to approximately 150 adult leafhoppers (*Baldulus maidis*) hatched and reared on a diseased maize plant. Fourteen other plants of the same age and variety were similarly exposed to virus-free leafhoppers. All the plants exposed to the first colony showed stunt five to six weeks after exposure, while all the others remained healthy during three months' observation. In another test, seven of 16 New Jersey No. 2 field maize plants exposed for one day to a colony of the insects hatched and reared on an affected plant showed stunt in 34 to 38 days after exposure, though all of 16 similar plants exposed to virus-free leafhoppers remained healthy. A further experiment gave similar results, all the evidence obtained demonstrating clearly that maize stunt is readily transmitted by this leafhopper.

CHALAUD (G.). **Sur la biologie de Fusarium heterosporum Nees (F. lolii (W. G. Sm.) Sacc.).** [On the biology of *Fusarium heterosporum* Nees (*F. lolii* (W. G. Sm.) Sacc.]—*Bull. Soc. Sci. Bretagne*, xvii, 3–4, pp. 127–136, 12 figs., 1940 (issued 1941). [Received 1945.]

Fusarium heterosporum [*R.A.M.*, xxii, p. 265] occurs in the autumn in the vicinity of Rennes, Brittany, on the flowers of *Agropyron repens* and *Lolium perenne*, pursuing a saprophytic existence on the honeydew exuded as a sequel to the attacks of *Claviceps purpurea* [ibid., x, p. 23; xiii, p. 382]. In relation to the true parasite, *F. heterosporum* behaves as a commensal antagonist, considerably hampering the growth of the former and often preventing sclerotial production. The material collected by the writer consisted of a red to orange stroma, dendriform conidiophores, and arcuate-fusiform, mostly triseptate conidia, 18 to 34 by 3·5 to 4·2μ (occasionally attaining a length of up to 60μ, with seven or more septa).

LOUCKS (K. W.) & HOPKINS (E. F.). **A study of the occurrence of Phomopsis and of Diplodia rots in Florida Oranges under various conditions and treatments.**—*Phytopathology*, xxxvi, 9, pp. 750–757, 7 graphs, 1946.

From some 4,000 isolations yielded by 850 separate samples of 50 oranges each, statistical analyses were made at the Citrus Experiment Station, Lake Alfred, Florida, of the incidence of stem-end rot (*Diaporthe citri* and *Diplodia natalensis*) in fruits of the Hamlin, Parson Brown, Pineapple, and Valencia varieties treated against the disease by debuttoning, gassing with ethylene, soaking in borax, wrapping in diphenyl-impregnated paper, calyx removal by various methods, storage at high or low relative humidity (90$\pm$4 per cent. and 79$\pm$3° F. or 56$\pm$7 per cent. and 75°, respectively), and different combinations of these procedures.

No correlation could be established between the occurrence of the two fungi in the same fruit. The amount of infection by both organisms was reduced by

debuttoning and by five minutes' immersion in a 5 per cent. borax solution before or before and after gassing, while removal of the calyx alone decreased the incidence of *Diaporthe citri* but not that of *Diplodia natalensis*. Borax alone was effective against *D. natalensis* only. Gassing with ethylene for 48 hours at 85° and 90 per cent. relative humidity was not only ineffectual as a control measure but actually promoted invasion by *D. natalensis*. Wetting the fruit after picking did not affect either of the fungi, but *D. natalensis* was favoured by a high relative humidity in the storage room. The use of diphenyl-treated wraps [*R.A.M.*, xxiii, pp. 104, 252] failed to prevent infection by either of the pathogens.

Viennot-Bourgin (G.) & Brun (J.). **Sur la présence du 'sour rot' des Agrumes en France.** [On the presence of Citrus sour rot in France.]—*Rev. Bot. appl.*, xxv, 275–276, pp. 10–15, 2 figs., 1945.

Early in 1944, the authors observed *Oospora citri-aurantii* [*R.A.M.*, vii, p. 163; xxi, p. 352, *et passim*] on sour orange (*Citrus bigaradia*) [*C. aurantium*] fruits from the south of France on sale in the Paris market [ibid., xxv, p. 557]. When the affected fruits were left in the open air they rapidly collapsed, the flesh becoming partially deliquescent; when they were placed in a dry atmosphere at a constant temperature of 12° C., they became mummified. The results of inoculation experiments showed that infection resulted only when spores were placed on the pulp, the mycelium appearing six to eight days after the pulp had become soft and the skin had collapsed and become translucid. When deep inoculations were made into the flesh, characteristic sour-rot symptoms developed in four or five days. These results indicate that *O. citri-aurantii* is an active parasite which causes a rapid generalized rot of sour oranges, infection occurring on mature fruits as a result of deep wounds in the flesh; superficial scratches are of no importance. In southern France wounds facilitating infection probably result from insect attack.

Roumain (P.). **La mort de nos Cocotiers et le problème de la quarantaine.** [The death of our Coco-nut Palms and the quarantine problem.]—*Rev. agric. Haiti*, i, 2, pp. 75–82, 1945.

The coco-nut disease referred in Jamaica to bronze leaf wilt (though as explained in a footnote it is now held by Leach to be distinct) [Leach's 'unknown disease' of coco-nut: *R.A.M.*, xxv, p. 447] is stated to be a limiting factor in coco-nut production in Haiti, where it occurs, as in Jamaica [ibid., xxiv, pp. 354, 367], on all types of soil. The available information on the disease is summarized and the following approach to the quarantine problem proposed. Agronomists and agricultural agents should carefully examine the palms in their respective sectors and immediately notify the Central Bureau of any suspected cases of the disease. In the north, north-eastern, and Gonaives agricultural districts diseased palms should be felled and totally destroyed by fire. No new coco-nut plantings should be laid down for many years to come, either in the areas already invaded or (even more important) in those, such as Jean-Rabel, where the wilt has not yet appeared.

Malençon (G.). **L'infection florale du Dattier par le Fusarium albedinis (Kill. et Maire) Mlçn.** [Floral infection of the Date Palm by *Fusarium albedinis* (Kill. & Maire) Mlçn.]—*C. R. Acad. Sci., Paris*, ccxxiii, 22, pp. 923–925, 1946.

The inoculation of date palm inflorescences with a microconidial suspension of *Fusarium* [*Cylindrophora*] *albedinis*, the agent of baïoud disease [in Morocco: *R.A.M.*, xiii, p. 505], resulted in the deep penetration of the carpels by the hyphae of the fungus, which insinuated themselves between the parenchyma cells and progressively destroyed them. The pathogen is evidently dependent on pectic

compounds for its sustenance, since it was capable of entry only through the mucilaginous mass coagulating on the papillae on the surface of the stigmata and pursued its search for them in the underlying tissues.

ALBERT (W. B.). **The effects of certain nutrient treatments upon the resistance of Cotton to Fusarium vasinfectum.**—*Phytopathology*, xxxvi, 9, pp. 703–716, 6 graphs, 1946.

A tabulated account is given of the writer's experiments at Clemson Agricultural College, South Carolina, in 1943–4 to determine the reactions of the Half and Half cotton variety, which is highly susceptible to wilt (*Fusarium vasinfectum*), to different sources of nitrogen at two pH levels, 6·6 to 6·8 and 5 to 5·3 [cf. *R.A.M.*, vii, p. 320; xix, p. 403; xx, p. 268], using Armstrong's technique for the growth of cultures for inoculation [ibid., xx, p. 531].

Plants grown in the high pH calcium nitrate solutions contracted markedly less wilt and their mortality was lower than those in any other solution, whereas severe symptoms developed more rapidly in plants in solutions of the same compound at the low pH than in those of any other series. Similar adverse effects were exerted by ammonium nitrate at the low pH. The course of the disease was slower in plants grown in solutions containing only nitrogen from ammonium sulphate than in those of the low pH calcium nitrate or ammonium nitrate series. Two interdependent factors, a pH of 6·6 to 7 and nitrate nitrogen derived from calcium nitrate at the particular nutrient balance used, are believed to have contributed significantly to an increase in wilt resistance.

SCHEER (D.). **Ein neuer parasitärer Pilz aus dem Darm der Wasserassel (Asellus aquaticus L.).** [A new parasitic fungus from the intestine of the Water Hoglouse (*Asellus aquaticus* L.).]—*Z. Parasitenk.*, xiii, 3, pp. 275–282, 12 figs., 1944. [Received November, 1946.]

The water hoglouse (*Asellus aquaticus*), a valuable food for fish in ponds in Upper Silesia, Germany, is parasitized by a hitherto undescribed fungus, to which the name *Rectícharella aselli* n.g., n.sp. is assigned. The diameter of the regularly branched, septate hyphae ranges from 6 to 20μ, and their maximum length is 2·8 mm. They disintegrate for almost their full length into conidia, which germinate to produce new hyphae. The host does not appear to suffer from the fungal infection.

COLHOUN (J.). **Observations on the effects of browning (Polyspora lini Laff.) of Flax on seed production.**—*Ann. appl. Biol.*, xxxiii, 3, pp. 255–259, 1946.

During experiments carried out in 1941, 1942, and 1944 on the disinfection of flax seed against *Polyspora lini* [*R.A.M.*, xxii, p. 358; xxiv, p. 370], it was found that the *M* weight (of 1,000 seeds) of heavy or winnowed seeds harvested and the incidence of browning were inversely related; as the incidence of the browning became more severe the *M* weight of the winnowed seeds declined. On the whole, maturing seeds in a crop grown from heavily infected seeds appear to acquire infection earlier than those in comparable crops produced from less heavily contaminated or from disinfected seeds. The fact that during several seasons *P. lini* has been observed to spread less rapidly in crops from treated than from untreated seed supports this hypothesis.

In 1942 a direct and significant correlation was shown to exist between the incidence of browning and the percentage number of poorly developed, light-weight seeds, and these were more heavily contaminated with *P. lini* than the heavy-weight seeds from the same crop whether disinfected or not. Also the incidence of the disease was directly related to the number of heavy seeds infected

at harvest, a result according with the findings of Kazina in 1935 [ibid., xv, p. 652]. Unpublished records for Northern Ireland indicate, however, that this relationship is not found in every season.

Seed from apparently healthy plants was almost completely free from infection and a high percentage of it was heavy-grade. Plants with marked browning yielded quite a high proportion of disease-free seed. The percentage germination of heavy seeds was not reduced by the intensity of browning [loc. cit.] in the crop or the incidence of the pathogen on the seed.

The effect of seed treatment, therefore, is to reduce browning and also to increase the quantity and quality of heavy-grade seed.

COLHOUN (J.). **The relation between the contamination of Flax seed with Polyspora lini Laff. and Colletotrichum linicola Pethybr. & Laff. and the incidence of disease in the crop.**—*Ann. appl. Biol.*, xxxiii, 3, pp. 260–263, 1946.

In view of the difficulty experienced in eliminating *Polyspora lini* from flax seed by seed treatment [*R.A.M.*, xxii, p. 358 and preceding abstract], it was considered necessary to study the effect of using infected seed, and the relation between the degree of infection and the incidence of the disease in the crop [ibid., xv, p. 652]. Only naturally contaminated seeds were used and *Colletotrichum linicola* was included in the investigation, as no satisfactory control of this parasite by seed treatment had been obtained by 1940, when these experiments were begun.

From seed of several varieties 30 samples were chosen giving a range of contamination with *P. lini* from 0 to 35·2 per cent., and 17 with *C. linicola* infection ranging from 0 to 46·6 per cent. The crops from seed infected by the former did not develop serious disease where seed-contamination was less than 5 per cent. The varieties Stormont Cirrus, Liral Monarch, and Liral Crown from seed with 0·2 per cent. contamination showed no infection in the early phases and only 1, 0·5, and 0 browning respectively [on a scale where 0 is no disease and 10 is maximum] by the end of June, 1940. Stormont Cirrus seed with 7·8 to 35·2 per cent. seed contamination showed generally maximum infection at all stages of growth.

The results obtained with *C. linicola* in 1940 showed that incidence of the disease in the seedling phase is related to the percentage of contaminated seeds, maximum attacks occurring when seed infection was 13·2 per cent. in Liral Dominion, 32·4 in Liral Monarch, and 21·2 in Liral Crown.

In further experiments in 1942 with Liral Prince and Liral Crown, seed samples, carrying varying degrees of contamination with either *P. lini* or *C. linicola*, were prepared from heavily contaminated samples by mixing varying quantities of healthy seed of the same variety with them. The percentage number of plants infected with *P. lini* in the seedling or stem-break stages was in general related to the percentage of contaminated seeds. Seedling infection was less than 5 per cent. when seed-contamination was 15·6 per cent. or less in Liral Prince and 19 per cent. or less in Liral Crown, but at the stem-break stage only plants from seed with 1·6 per cent. or less contamination showed under 5 per cent. attack.

With *C. linicola* agreement was also shown between the percentage contamination of the seed and the number of infected plants, although it was less striking than in the case of *P. lini*, due probably to the more rapid spread of *C. linicola* from plant to plant.

MUSKETT (A. E.) & COLHOUN (J.). **Seedborne diseases of Flax and their control.**—*Ann. appl. Biol.*, xxxiii, 3, pp. 331–333, 1946.

At a joint meeting of the Association of Applied Biologists and the Microbiological Panel of the Food Group of the Society of Chemical Industry on 12th April, 1946, the authors reviewed the work that has been done in Northern Ireland

on the control of seed-borne diseases. The production of 100,000 acres of flax a year from seed supplied from the United Kingdom crops was an undertaking to which the mass production of nomersan [*R.A.M.*, xxii, p. 359] greatly contributed. The disinfection of all seed for sowing purposes, the testing of all bulk samples for moisture content, purity, and germination, and the rejection of all seed below standard have now been generally adopted in the British Isles.

A comprehensive survey of flax seed produced in the United Kingdom has been carried out during the past three years. Some 5,000 samples have been examined by the Ulster method [ibid., xx, p. 261] for contamination with *Colletotrichum linicola* and *Polyspora lini* [see preceding abstracts], *Botrytis* sp. [ibid., xxiii, p. 132], *Phoma* sp. [ibid., xxv, p. 33], and *Fusarium lini* [ibid., xxiv, p. 58], the last-named being of little concern in the British Isles as a seed-borne parasite because of its rare appearance as a seed-contaminant. The survey has shown that flax seed produced in the south and east of England is much freer from seed-borne parasites than that from the wetter, northern and western parts of the British Isles. Seed contamination may be said to be much higher north and west of the Pennines than to the south and east, although flax rust (*Melampsora lini*) [ibid., xxv, p. 114] is found far more frequently in crops grown from seed produced in south and east England than from that produced in the north and west.

Apart from *Phoma*, which was not present to any extent until 1943, *C. linicola* has proved to be the most dangerous seed-borne pathogen, a progressive increase having been observed in seed stocks produced in the north and west of the British Isles. As a result, however, of the general adoption of seed-disinfection, which is remarkably effective against *C. linicola*, no epidemic of seedling blight in the flax crop occurred during the recent war such as caused serious losses in 1914 to 1918. Some £2,000,000 is estimated to have been saved by this. The inclusive cost of disinfecting sufficient seed to sow one acre is half a crown.

MILLIKAN (C. R.). **Frost injury to Flax.**—*J. Dep. Agric. Vict.*, xliv, 8, pp. 381–384, 6 figs., 1946.

A detailed description of frost damage to flax in Victoria where it is not uncommon. Affected plants generally occur individually or in small isolated lengths of drill row, random in distribution. Young plants in thickly sown patches appear to be more susceptible than those normally spaced.

Laboratory experiments showed that flax is most sensitive to frost in the two-leaf stage, after which it rapidly becomes very resistant until it is at least 4 or 5 in. high; with increasing age, it then again shows sensitivity. Susceptibility to frost is increased by soil waterlogging.

THOMAS (I.) & MILLINGTON (A. J.). **Flax and Linseed breeding in W.A. Wada, a new rust resistant Flax variety.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxiii, 1, pp. 39–42, 2 figs., 1946.

With a view to establishing flax and linseed as commercial crops in Western Australia, the linseed variety, Punjab, an Indian type grown widely under irrigation in California, was introduced and cultivated. Owing, however, to its susceptibility to a local race of rust [*Melampsora lini*], and its relatively late maturity, which exposed the seed pods to cutworm attack, the establishment of a linseed-growing industry had to be abandoned. For breeding purposes several very early maturing and rust-resistant strains are being increased for commercial testing at the Avondale Research Station.

An early maturing and rust-resistant flax variety, Wada [*R.A.M.*, xxvi, p. 15], has been bred by A. J. Millington from a few rust-resistant Riga Crown plants, a variety originating in the Baltic States. Wada resembles Liral Crown in growth habit and appearance, but is slightly taller.

CASS SMITH (W. P.) & HARVEY (H. L.). **Flax rust in Western Australia.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxiii, 1, pp. 42–44, 1946.

Flax rust (*Melampsora lini*) has proved a major limiting factor in Western Australia to the economic production of this crop [see preceding abstract], which was expanded during the war and is menaced thereby in its permanent establishment as a peace-time industry in the State. Although the loss in the fibre varieties has not been so serious as in linseed, straw yields were reduced by 20 per cent. in 1942, with a 10 per cent. drop in straw values over roughly 8,000 acres.

Six races of the rust have now been identified from Western Australia and ten provisionally determined for Australia and New Zealand. Of these A is typically a pathogen of linseed varieties, such as Punjab, and the cause of severe loss on commercial crops in the Avon Valley districts; B, C, D, and E, of which the last-named is the most virulent, attack fibre varieties such as Concurrent and Liral Crown; and G, recorded from one locality only, mainly attacks linseed varieties.

That flax rust also occurs on the wild species, *Linum marginale*, has long been known in south-eastern Australia, but it had not been recorded in Western Australia prior to the cultivation of commercial flax during the war [ibid., xxi, p. 454]. The wide distribution and perennial habit of *L. marginale* caused it to be regarded as an important potential source of *M. lini* and thus a danger to commercial crops. A survey disclosed that race A seems to be most widely distributed on wild flax and that races E and G are also found on it. The fact that four races have been recorded for the Boyup Brook area and adjacent districts where wild flax grows abundantly, suggests the likelihood that, apart from harbouring rust, *L. marginale* may play an important part in the production of new races by natural crossing.

Since 1943, 'rust-indicator' plots have been set up with a view to facilitating the discovery of new races, and to investigate more fully the distribution of those already recorded. Ottawa 770B and Argentine Selection (C.I. No. 462) have shown immunity on all sites. Uruguay 36/38 has shown high resistance throughout. Immune variants of other varieties have been noted.

JOFFILY (J. M.). **Cercosporiose da piteira.** [Cercosporiosis of the fibre plant.]—*Rodriguésia*, ix, 19, pp. 25–28, 4 pl., 1945. (Issued 1946.)

In 1942 *Fourcroya* [*Furcraea*] *gigantea* [Mauritius hemp] was attacked in an experimental planting in Rio de Janeiro, Brazil, by *Cercospora fourcroyae*, which was observed by Botero on *F.* sp. in Colombia for the first time in 1941 (*Caldasia*, iii, pp. 48–50, 1942). The fungus produces on both leaf surfaces sunken, circular or elliptical, scattered or confluent, light brown lesions, 5 to 15 mm. in diameter, with a dark chestnut margin; the older leaves wither from the tip downwards. The disease is most troublesome on plants up to $2\frac{1}{2}$ years old. The acropleurogenous, subhyaline, obclavate, slightly curved or fusoid, usually 7- to 9-septate conidia, subtruncate at the base and tapering towards the apex, measure 40 to 110 by 5 to $6{\cdot}5\mu$ and are borne on densely fasciculate, olivaceous, simple or branched, procumbent, flexuous, sometimes geniculate, pluriseptate conidiophores, 54 to 180 by 5 to 8μ.

STOFMEEL (W. S.). **De Botrytis-aantasting van Gladiolusknollen en haar bestrijding.** [The *Botrytis* infection of *Gladiolus* corms and its control.]—*Tijdschr. PlZiekt.*, xlvii, 4, pp. 154–163, 3 pl., 1941. [Received November, 1946.]

Although *Botrytis gladioli* has long been known as a pathogen of stored gladiolus corms [*R.A.M.*, xxv, p. 501] in Holland, it was not until the winter of 1937–8

that the trouble assumed an alarming form, while heavy losses were again experienced in the seasons of 1939 to 1940 and 1940–1. Corms lifted late (end of October) sustained heavier damage than those dug between mid-September and mid-October. Control may be effected by rapid drying in a warm (24° to 26·5° C.), well-ventilated barn.

HAWKER (LILIAN E.). **Diseases of the Gladiolus. III. Botrytis rot of corms and its control.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 200–208, 1946.

In this third paper on diseases of gladioli [cf. *R.A.M.*, xxiv, p. 103] *Botrytis* corm rots are compared with those described by Moore [ibid., xix, p. 153]. The three types of rot associated with *Botrytis* are (1) depressed, rounded lesions, straw-coloured in the centre but deep or reddish-brown at the margin and below the tightly stretched and often cracked skin usually a cavity, (2) a spongy rot affecting the whole corm, and (3) core rot. The first type has been seen only after hot summers or in inoculated corms stored at high temperatures. It is suggested that all three rots may be different forms of the same disease.

Of 346 corms of different varieties rotting in storage during the winter of 1939–40 and examined in March, 96 were completely rotted (spongy type), 197 showed core rot spreading along the vascular strands and into the ground tissue of the corm, many being almost completely rotten, 47 had corm rot developing down from a point of infection at the scar left by the old shoot, 23 with similar rot passing up from the basal plate, and 51 had started rotting from the surface at some other point. When the old stem base could not be lifted out, leaving a clean, depressed scar, the corms often developed core rot later. This occurred frequently with the varieties Yvonne and Picardy.

Losses after planting were usually less serious than those in storage, but the early appearance of core rot in the parent corm often caused a failure of shoot emergence. It is probable that such corms carried a dormant form of the fungus when planted. *Botrytis* was isolated from young shoots or corms following premature yellowing of the new foliage. The rotting of young shoots at or below ground-level may be due to mycelium in the soil, as surface sterilization of the corms with mercuric chloride, while reducing the losses after planting failed to protect new corms from infection during the growing season. Spores from rotting shoots may be washed down by rain and so provide an alternative means of contaminating young corms, which may either be rotten at lifting or develop the disease in storage.

Numerous isolations yielded invariably similar strains of *B. cinerea* with conidia 12 to 15 by 9 to 12μ. *B. gladioli* [ibid., xxv, p. 394 and cf. preceding abstract] was not encountered. Inoculation tests showed that the proportion of infections was highest when the inoculum was inserted into wounds in corms stored under cool, moist conditions.

Of several control measures tested [ibid., xxiv, p. 373], dusting with pentachloronitrobenzene (folosan) [ibid., xxiv, p. 103] before storing gave good control, but steeping in a 0·1 per cent. solution of mercuric chloride for 20 minutes to 3 hours almost completely eliminated the infection and also controlled hard rot (*Septoria gladioli*) [loc. cit.], scab (*Bacterium marginatum*) [see next abstract], and to some extent dry rot (*Sclerotinia gladioli*) [ibid., xxiv, p. 103], although this may damage the corms.

Corms should be lifted not later than mid-October, cleaned immediately, dried rapidly, and stored in shallow trays in a dry, well-ventilated shed, protected from frost. The use of folosan dust not only protected the old corm but prevented the infection of new ones, and these effects continued into the subsequent storage period. It is also recommended that heavy, wet soils, shaded sites, and ground previously used for gladioli should be avoided.

HAWKER (LILIAN E.). **Diseases of the Gladiolus. IV. Note on the incidence and control of scab disease (Bacterium marginatum McCull.).**—*Ann. appl. Biol.*, xxxiii, 2, pp. 209–210, 1946.

Although Moore included scab (*Bacterium marginatum*) [*R.A.M.*, iv, p. 286; xii, p. 680] in the four principal diseases of gladiolus in Britain [ibid., xix, p. 153], observations during the seasons 1938 to 1945 show that, except during the hot summer of 1940, very little scab has occurred. In 1942 and 1943 there were, respectively, only 52 and 29 diseased corms out of 2,000 to 3,000 examined. The incidence was, therefore, too low for any data on its control to be collected from the many fungicidal experiments primarily designed to control other diseases of the same host [see preceding abstract]. Tests of fungicidal treatments during 1940 and 1941 when enough scabbed corms were available showed that mercuric chloride gave good control, but the method requires further testing on corms cleaned to growers' standards, with the husks intact. Carry-over of scab from year to year in the corms appears to be slight under field conditions, but in a heated greenhouse it is considerably higher.

TOMPKINS (C. M.) & ARK (P. A.). **Seedling disease of Yellow Calla, caused by Corticium solani, and its control.**—*Phytopathology*, xxxvi, 9, pp. 699–702, 1946.

A destructive seedling disease of yellow calla (*Zantedeschia elliottiana*), causing annual losses of 25 per cent. and upwards, with occasional total failures, is prevalent in commercial plantings in the Capitola–Santa Cruz section of California. Its development is promoted by warm weather, excessive humidity, poor soil drainage, the use of dirty, untreated seed, close planting, and mulching. The most conspicuous symptoms of the trouble, as observed during the last five years, are a brownish-black discoloration of the cortical tissues of the fibrous roots, both before and after emergence, usually proceeding from the tip to the crown; shrivelling and sloughing-off of the invaded tissues; foliar chlorosis, wilting, collapse, and death; and sometimes pre-germination decay of the seed.

Corticium solani was isolated consistently from infected seedlings and gave positive results in greenhouse soil inoculation tests, one strain (from Capitola) causing 25 per cent. pre- and 48 per cent. post-emergence loss and another (from Santa Cruz) 32 and 51 per cent., respectively. The minimum, optimum, and maximum temperatures for the growth of the two isolates were 7°, 25° to 28°, and 37° C., respectively. Control may be effected by thorough cleansing of the seed, dusting with spergon or some other suitable fungicide, and avoidance of the improper cultural practices mentioned above.

ARK (P. A.) & THOMAS (H. EARL). **Bacterial leaf spot and bud rot of Orchids caused by Phytomonas cattleyae.**—*Phytopathology*, xxxvi, 9, pp. 695–698, 1 fig., 1946.

Considerable damage is caused in orchid houses in the San Francisco Bay region of California by an organism attacking *Phalaenopsis* and *Cattleya* spp. believed to be identical with that described by Pavarino (*R. C. Accad. Lincei*, xx, pp. 233–237, 1911) as *Bacterium* (*Phytomonas*) *cattleyae*. It is a Gram-negative, non-spore-forming rod, 2·4 by 0·4 to 0·6μ, occurring singly and in pairs, motile by means of one or two lophotrichous flagella, producing on beef extract-peptone agar (pH 6·9) at 28° C. greyish-white, iridescent, smooth, butyrous colonies with criss-cross markings like fish scales. Good growth was made in various liquid media, e.g., the synthetic carbohydrate of the Society of American Bacteriologists, Fermi's, Cohn's, and Uschinsky's. Starch is slowly digested, gelatine is not liquefied, hydrogen sulphide and indole are not produced, nitrates are reduced to nitrites.

Acid without gas is evolved in the synthetic carbohydrate medium with the addition of 1 per cent. arabinose, dextrose, dulcitol, galactose, glycerol, lactose, levulose, mannitol, sucrose, or xylose. The optimum temperature for growth ranges from 25° to 35°, and the thermal death point is 48°.

The bacterium forms on the wounded or unwounded leaves light, later dark chestnut-brown spots, coalescing to cover large areas of the surface, extending under humid conditions and at favourable temperatures to the crown, and sometimes killing the plant. Inoculations were successful on *Epidendrum o'brienianum*, *Dendrobium* sp., *Cypripedium* sp., *Phalaneopsis amabilis*, and *Vanilla*. Control may be effected by the removal of diseased plants and dabbing the lesions with a sponge soaked in 1 in 1,000 mercuric chloride.

Roodenburg (J. W. M.). **Vaat-en voetziekten in Amerikaanse Anjers.** [Vascular and foot rots in American Carnations.]—*Tijdschr. PlZiekt.*, li, 1, pp. 16–24, 1945. [Received November, 1946.]

The carnation foot rot caused by *Fusarium dianthi* is of no importance in Dutch nurseries, the author, in fact, never having observed the disease in the Aalsmeer district. On the other hand, *Phialophora* (*Verticillium*) *cinerescens* [*R.A.M.*, xix, pp. 368, 517] is responsible for severe damage and should be combated by planting in soil freed from the pathogen either by crop rotation, e.g., with tomatoes and roses, a period of two years probably sufficing, or by sterilization with steam (three hours at 80° C.) or 1 per cent. formalin (4 l. per 8 pots). The potting soil for the propagation of cuttings must also be absolutely clean. None of the varieties in local cultivation is immune from *V. cinerescens*, but some degree of resistance has been shown by Garnet Beauty, Vivian, Puritan, King Cardinal, Peter Fisher, and Bonanza.

Stevenson (J. A.). **Ferns and fungi.**—*Amer. Fern J.*, xxxv, 4, pp. 97–104, 1945.

This is a popular account of the numerous fungal parasites of outdoor and greenhouse ferns in the United States and Canada, including the rusts *Uredinopsis*, *Milesia* [*Milesina*], and *Hyalopsora*, with their alternate stages on firs (*Abies* spp.); at least ten gall- and spot-producing species of *Taphrina* [*R.A.M.*, xviii, p. 141]; the agents of tar spot, *Cryptomycina pteridis* and *Catacauma flabellum*, on bracken (*Pteridium*); *Cylindrocladium pteridis* causing a brown leaf spot of *Polystichum adiantiforme*; and three destructive pathogens of species grown for indoor decoration, i.e., *Glomerella nephrolepis* on *Nephrolepis exaltata*, *Pestalotia cibotii* on *Cibotium schiedei*, and *Alternaria* sp. on *Polypodium*.

Several ferns, especially in the south, harbour the causal organisms of serious diseases of economic crops, such as *Sclerotium rolfsii*, *Rhizoctonia* [*Corticium*] *solani*, and *Pellicularia* [*Corticium*] *koleroga* [ibid., xxii, p. 372].

Munro (Moira) & Ogilvie (L.). **Clover rot investigations.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 150–153, [? 1946].

The presence of clover rot (*Sclerotinia trifoliorum* [*R.A.M.*, xx, p. 72; xxiii, p. 24]) has been familiar in the Bristol area for many years and a large number of outbreaks are reported in some seasons. As little is known of its behaviour under the climatic conditions of south-west England, fields at Abson in south Gloucestershire and Chedzoy, Somerset, were placed under observation from 1944 to 1946, and in early March, 1945, the fungus was isolated at both places from red clover plants which showed the characteristic symptoms. A few weeks later almost all the red clover had been destroyed and widespread infection of trefoil (*Medicago lupulina*) was seen. Sclerotia were abundantly produced and large numbers of apothecia appeared in the autumn at both sites until mid-December, but no initial infection on fresh shoots was noted up to the end of

February, notwithstanding apparently favourable conditions for the infection of the plants. Ascospores germinated almost at once, even at low temperatures.

Greenhouse and field inoculation experiments begun in the autumn of 1945, using ascospore suspensions, resulted in two cases only from which *S. trifoliorum* was recovered. In October, however, when groups of apothecia-bearing sclerotia were introduced into the soil surrounding four healthy clover plants kept in moist chambers, three of the plants showed *Sclerotinia* infection by December [loc. cit.]. Further successful experimental infection followed the use of a culture of the fungus growing on a wad of sterilized clover leaves.

Tests with seed from clover-rot fields produced cultures of a fungus resembling *S. trifoliorum*. It remains to be explained why outbreaks are relatively so few, and so slow to appear in fields where ascospores are shed and under climatic conditions apparently conducive to infection.

CORMACK (M. W.). **Sclerotinia sativa, and related species, as root parasites of Alfalfa and Sweet Clover in Alberta.**—*Sci. Agric.*, xxvi, 9, pp. 448–459, 2 pl., 1946.

Further studies carried out in Alberta on the fungi associated with root rot of lucerne (*Medicago sativa* and *M. falcata*) and sweet clover (*Melilotus alba* and *M. officinalis*), particularly *Sclerotinia sativa* [*R.A.M.*, xxii, p. 27; xxiii, p. 108], showed that this fungus is sometimes very destructive to sweet clover locally in early spring but seldom attacks lucerne; it is not at present widely distributed. *S. sclerotiorum* occasionally damages lucerne and sweet clover in summer, but is more prevalent on sunflowers and vegetables. *S. minor* and *S. trifoliorum* have not yet been found on any host in Alberta.

S. sativa is a low-temperature parasite of dormant plants. It rapidly invades the roots of its hosts as the frozen soil is thawing in early spring, but its progress is arrested when host growth starts. In winter inoculation tests under field conditions it severely infected sweet clover, produced slight to moderate damage on lucerne and red clover (*Trifolium pratense*), and only slight injury on alsike clover (*T. hydridum*), while parsnip and 20 perennial wild plants were also susceptible. *S. sclerotiorum* was more virulent in summer than in early spring, and caused more damage to sweet clover than to lucerne or red and alsike clovers. *S. minor* attacked legume forage crops to about the same extent as *S. sativa*, but caused most damage in summer. *S. trifoliorum* caused more severe injury to legume forage crops and beans (*Vicia faba* and *Phaseolus vulgaris*) than any other species tested, but was not seriously damaging to any non-leguminous host except sunflower. A species of *Botrytis* of the *cinerea* type, frequently associated locally with root rot of lucerne and sweet clover, was usually only weakly virulent on all the hosts studied. Isolates of *S. sativa* from tulip bulbs were considerably more virulent to lucerne than those from legumes.

S. sativa persisted in fallowed soil and severely damaged sweet clover even after eight years, though the sclerotia rapidly decayed in moist soil. No apothecia of this or any other species studied were found under natural conditions.

In pure culture, *S. sativa* and *S. trifoliorum* grew best at 17° to 19° C., *S. minor* and *Botrytis* sp. at 20°, and *S. sclerotiorum* at about 25°. Sclerotial formation was inhibited or retarded in all species at temperatures under 10° and growth ceased at about 30°.

MENZIES (J. D.). **Witches' broom of Alfalfa in North America.**—*Phytopathology*, xxxvi, 9, pp. 762–774, 2 figs., 1946.

A comparative study of the symptomatology of the witches' broom of lucerne which is assuming a serious form in localized areas of Washington [*R.A.M.*, xxiv, pp. 151, 268; xxv, p. 385], where it was first observed in 1925, and British Columbia [ibid., xxiii, p. 3], and the disease of the same name in Australia [ibid., xiv, p. 516]

revealed no definite differences. The affected plants are stunted, with a dense proliferation of shoots from the crown, and die after one to three years from the onset of the attack. Heavy infection causes a rapid reduction in the stand. Witches' broom occurs naturally on lucerne, red and White Dutch clover, and occasionally on *Medicago lupulina* in Washington, and has been reported from Alberta on sweet clover (*Melilotus*) by M. W. Cormack in *Rep. Canad. Plant Dis. Surv.*, xx, p. 22, 1941), and W. C. Broadfoot (ibid., xxi, p. 19, 1942). At the Irrigation Branch Station, Prosser, Washington, the virus responsible for the lucerne disease was transmitted to *Medicago lupulina* and *M. hispida* by root- and shoot-grafting, and from infected to healthy lucerne plants by means of the leaf-hopper *Platymoideus acutus*, but negative results followed the use of mechanical methods, dodder (*Cuscuta campestris*), or the seed of plants suffering from witches' broom.

Ramesh Adyanthaya (N.). **A note on the occurrence of Sphacelia on Cenchrus ciliaris.**—*Curr. Sci.*, xv, 10, pp. 286–287, 2 figs., 1946.

The author observed a species of *Sphacelia* on *Cenchrus ciliaris* (a common fodder grass) at Coimbatore. The hyaline, falcate conidia had more or less pointed ends, were one-celled, with two to six conspicuous vacuoles, and measured 18·37 by 5·96μ. They germinated readily in water, producing an oval secondary conidium at the tip of the germ-tube. The grass has not previously been included in the host list of *Sphacelia* for South India [*R.A.M.*, xxv, p. 36].

Onderzoek naar de beste tijdstippen der voorjaarsbespuiting tegen Appel en Perenschurft, deel II. [Investigation on the best dates for the spring spraying against Apple and Pear scab, part II.]—*Tijdschr. PlZiekt.*, xlviii, 2, pp. 33–60, 1 pl., 2 graphs, 1942. [Received November, 1946.]

This paper incorporates the results of a four-year (1938 to 1941) investigation on the most suitable times for the spraying of apple and pear trees against scab (*Venturia inaequalis* and *V. pirina*) in Holland, part I of which has already been published [*R.A.M.*, xxii, p. 254]. The work was carried out by L. Gersons at Wageningen, B. K. Bartelds in the province of Utrecht, W. G. v. d. Kroft in South Limburg, J. D. Gerritsen in the Betuwe, B. Bosma in South Beveland, and D. Kers in the Hoeksche Waard, and is summarized by H. M. Quanjer, who instigated the inquiry.

The conidia were found to be of more importance as sources of infection in the case of pear scab than in that of apple [cf. ibid., xiv, p. 40; xxv, p. 399]. On pear branches conidia were found in wet weather before the discharge of the ascospores, which did not appear until the beginning of April. On severely infected trees the conidia of *V. inaequalis* may also precede the ascospores, but the latter play a more important part in the establishment of infection. Once the first perithecia reach maturity, from the end of March to mid-April, a shower will release the first ascospores, the forerunners of the one or more main 'flights' following further rainy spells until about 1st June, when the supply becomes exhausted.

When spray warnings are based on ascospore 'flights', wet weather may prevent the operations or the fungicide may be washed away before it has dried on the foliage. In such cases infection may take place which might have been forestalled by growers spraying according to the stage of bud development. In years such as 1938 and 1940, when the first ascospore discharge coincided with a very early stage in bud development and the main 'flight' with 'pink bud' in apples and 'white bud' in pears, the dates recommended for the two pre-blossom sprays would be approximately the same whether the criterion applied in the forecasts is ascospore discharge or bud development, and no superiority of one method over the other can be discerned. In other years, however, e.g., 1939 and 1941 in the case of apples, and the latter in that of pears, when a few weeks intervene between

the main ascospore 'flight' and blossoming, ascospore liberation is likely to afford a more reliable basis for spray warnings than bud development [see next abstract]. With late-blooming varieties, a month may elapse between bud-burst and the onset of the blossom, necessitating three applications, one to anticipate the forerunners and the others the first and succeeding 'flights' of ascospores.

HUS (P.). **Schurftbestrijding bij Appel en Peer.** [Apple and Pear scab control.]—*Tijdschr. PlZiekt.*, xlviii, 2, pp. 61–62, 1942. [Received November, 1946.]

Referring to the investigation of Quanjer and his collaborators into the method of determining the best dates for the treatment of apple and pear trees against scab (*Fusicladium*) [*Venturia inaequalis* and *V. pirina*] in Holland [see preceding abstract], the writer briefly discusses the relative merits of ascospore liberation and bud development as criteria for the issue of spray warnings. In 1941 predictions based on ascospore discharge in the Wageningen district gave more generally satisfactory results than those based on bud development. The season, however, was abnormal, the heavy precipitation and low temperatures in April and May having unduly retarded growth, so that too long an interval was left between the first and second pre-blossom sprays and the coverage was consequently insufficient to protect the buds against infection. In order to reach a definite conclusion as to the superiority of one or the other method, similar trials would have to be continued for a number of years. In the writer's opinion, growers should be guided by bud development, taking care to spray often enough to protect the trees against infection.

The following are regarded as more or less insuperable objections to using ascospore discharge as a signal for spray warnings. (1) The occurrence of ascospore 'flights' in one locality, e.g., Wageningen, does not necessarily coincide with the same process in other fruit-growing areas, where rain may fall on different dates during the critical periods in April and May. (2) At the time of ascospore dissemination unfavourable weather conditions may prevent spraying on some of the appointed days, and once infection is established it is very difficult to suppress. (3) The treatment of large areas requires some days, so that even in fine weather part of the orchard may be reached too late. (4) Under such conditions the work could not be carried out on a co-operative basis. (5) Even if difficulties were met by spraying as soon as the perithecia were mature, too long an interval might then elapse between the treatment and the discharge of the ascospores under the influence of rainfall, the exact date of which can seldom be predicted several days beforehand. (6) In mixed plantings the perithecia may ripen sooner on the leaves of one variety than of another, resulting in several ascospore 'flights' which would have to be considered in fixing the spraying dates.

KEARNS (H. G. H.), MARSH (R. W.), & MARTIN (H.). **Experimental spraying programmes on Apples at Long Ashton : season 1945.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 132–140, 1 fig., [? 1946].

In spraying experiments against insect pests and apple scab [*Venturia inaequalis*: *R.A.M.*, xxv, p. 456] applications of fungicides in conjunction with D.D.T. emulsion or suspension on Worcester and Laxton's Superb varieties, gave the following combined mean percentages scabbed areas per leaf [computed by a method described in detail]: lime-sulphur, 0·28; copper sebacate [ibid., xxiii, p. 449], 0·63; tetramethylthiuramdisulphide [Dubay 1205–FF], 0·75; fermate, 1·23. Thus, the the first three treatments were markedly better than fermate (at 2 lb. per 100 gals.): lime-sulphur was not significantly better than sebacate (at 4 lb. per 100 gals.); or Dubay (at 2 lb. per 100 gals.).

The greatest spray damage occurred when sebacate was used with petroleum oil and the indications are that where summer oils are to be used with a fungicide,

one of these organic sulphur compounds would be preferable to lime-sulphur to minimize risk of spray damage. The scab-control figures obtained in the trials, however, indicate that these compounds are inferior in fungicidal value to lime-sulphur at the concentrations usually employed. Fermate has the further disadvantage that it leaves a tenacious and disfiguring deposit.

HOLBECHE (J. A.). **Boron deficiency in Apples. Observations at New England Experiment Farm.**—*Agric. Gaz. N.S.W.*, lvii, 1, pp. 17–21; 2, pp. 75–80; 3, pp. 132–136; 4, pp. 184–188, 13 figs., 1946.

The work of Savage and Broadfoot [*R.A.M.*, xvi, p. 819] on the use of borax dressings for the control of internal cork of apples [ibid., xxiii, p. 334] has been further developed in an extensive series of experiments from 1937 to 1942. It was confirmed that soil dressings were more effective and convenient than spray applications. Young, non-bearing trees should not be treated, as even small quantities of boron in the soil cause damage. Small bearing trees should receive ¼ lb., medium-sized ½ lb., and large 1 lb. borax per tree, during the months of June, July, and August [cf. ibid., xxv, p. 506]. The borax should be spread evenly on the soil in a ring 2 ft. wide, 2 to 3 ft. from the butt of the tree, and then lightly worked in. A further application should not be made until the trees begin to renew signs of boron deficiency, which is unlikely for some years and to be detected by an annual examination. Up to the present one dressing every five years appears sufficient.

Where supplies of borax are limited, or trees are only slightly affected, or if the grower has left the application of a soil dressing too late, a spray with 0·25 per cent. borax or 2½ lb. per 100 gals. water may be given. The spray should be repeated annually for two or three years, after which a year may be allowed to elapse without ill effects. Care in using the correct concentrations and methods is essential or severe damage may result.

In comparing the growth of treated and untreated trees no differences in blossoming were observed. The foliar growth of treated trees improved, their leaves were clearly of a darker green, and they did not fall until after the untreated trees were defoliated. Granny Smith fruits retained their green longer than those from untreated trees, and Jonathans were much brighter. Comparing fruit from soil-dressed apple plantations and that from sprayed trees, the fruit from the former was rather superior in appearance, texture, and flavour to that of the latter.

Of Jonathan and Granny Smith apples from soil-treated trees stored, respectively, from 2½ to 5 and 5½ to 7 months, those treated with 1 lb. borax per tree showed the lowest percentage of flesh breakdown. Maximum breakdown occurred in both varieties in fruit from plots treated with 3 or 5 lb. borax.

Applications of boron to the soil suggests their value in controlling the 'measles' condition affecting the Delicious variety of apple in some parts of New South Wales, but little improvement followed the treatment in other parts.

Apple varieties which showed no symptoms of cork over the six-year period were Milton, Stephens Seedling, Huntsman, Wallace Howard, Tates, Buncombe, and Senator, while Northern Spy and Rome Beauty were very slightly, and Delicious, London Pippin, and Crofton, slightly affected.

Leaf analyses revealed that symptoms of corking appear only when the boron content of the leaves falls below 19 p.p.m.

FLORENZANO (G.). **Mycosphaerella sentina (Fuck.) Schroet. Occurrence of the perithecial stage in Italy and observations relative to its biology.**—*Int. Bull. Plant Prot.*, xx, 3–4, pp. 17M–26M, 7 figs., 1946.

In April, 1943, the author observed on dead pear leaves from Pavia the perithecia of *Mycosphaerella sentina* [*R.A.M.*, xvi, p. 191; xxi, p. 403]. Additional

specimens from other provinces received in May had ripe perithecia of the latter emitting ascospores. Further work in 1944 on the development of *M. sentina* showed that the perithecial primordia appeared in mid-February and that development up to full maturity took 55 to 65 days. The first mature perithecia observed in Calabria on 7th May, 1944, began to emit spores only after 19th May, though kept under favourable moisture conditions and at temperatures not below 12° C. In 1945 the primordia were detected in mid-January, reports of mature perithecia were received by 15th April, and the emission of ascospores obtained by 5th May.

The disease caused by *M. sentina*, known locally as 'seccume fogliare estivo' or summer leaf-shrivelling, is becoming more serious every year, both in northern and southern Italy. It reduces the vitality of pear trees and their yield. The observations showed that the perfect state ensures primary infection in the spring. Preliminary laboratory tests showed that the conditions requisite for ascospore discharge are a relatively high humidity and a temperature not under 12°. These conditions usually occur in Italy (in the open) from May onwards, when primary infection of pear trees is therefore possible. Direct infection of the fruit by the conidial state, *Septoria piricola*, was observed in Calabria and Florence. Preventive treatments should be applied in the beginning of June. Further work is in progress.

JENKINS (ANNA E.). **Elsinoe piri in France and Spain in the light of quarantine interceptions.**—*Mycologia*, xxxviii, 4, pp. 450–452, 1 fig., 1946.

The author records two further interceptions of *Elsinoe piri* [*R.A.M.*, xxv, p. 563] on apple fruits from Europe, one at Galveston, Texas, on 16th October, 1945, and the other at New York, on 6th January, 1945. The former consisted of two apples from Spain showing a few spots, vinaceous buff at the centre surrounded by dark mineral red, while the latter came from France, and consisted of large pieces of dried apple peel bearing numerous spots, on the larger of which the imperfect state was present in abundance, forming conspicuous, light-coloured pustules covered with a thick, dry crust of hyaline conidia. The only other record of *E. piri* from Spain was under the synonym *Melanobasidium mali* [*R.A.M.*, xi, p. 724]. Saccardo recorded the fungus from Paris as *Hadrotrichum pirinum* [loc. cit.]. Arnaud and Arnaud's *Melanobasidium* (?) on pear leaves at Chevreuse in 1930 and 1931 is certainly *E. piri*, as also is an apple fungus described in 1911 by Griffon and Maublanc. The combination *Sphaceloma pirinum* has been made by the author for the conidial stage [ibid., xxv, p. 563].

RUDOLPH (B. A.). **Attempts to control bacterial blights of Pear and Walnut with penicillin.**—*Phytopathology*, xxxvi, 9, pp. 717–725, 1946.

At the California Deciduous Fruit Field Station the antibiotic properties of penicillin were tested against the agents of pear and walnut blight (*Erwinia amylovora* and *Xanthomonas juglandis*, respectively) [cf. *R.A.M.*, xxvi, p. 18]. In preliminary tests in 1944 with unpurified material from an improved strain of *Penicillium notatum* (1249–b–21) [ibid., xxv, p. 353], the growth of *X. juglandis* was inhibited to a slight extent but that of *E. amylovora* was not affected. In 1945, however, the pure commercially prepared drug became available, and plate tests were conducted, in which dilutions in distilled water at the rate of 100 units per 0·1 ml. completely suppressed the development of *E. amylovora* in circular areas 25 or 35 mm. in diameter as seen under the microscope and by the naked eye, respectively. The pathogen grew normally in the presence of 10 units penicillin per 0·1 ml. *X. juglandis* was more susceptible, succumbing to a dosage of 10 units per 0·1 ml. over areas of 20 to 30 mm. in diameter, but not to 1 unit per 0·1 ml. Penicillin is bactericidal as well as bacteriostatic, no resumption of growth by the pathogens having been observed in subcultures made at frequent intervals for a fortnight from the inhibited zones. All attempts to combat either

organism by means of massive penicillin injections *in vivo* were unsuccessful, probably owing to excessive dilution of the drug by the sap of the tree trunks. In any case, the present prohibitive cost of penicillin would preclude its application in large-scale field experiments.

PHAFF (H. J.), MRAK (E. M.), ALLEMANN (RUTH), & WHELTON (RITA). **Microbiology of Prunes during handling and drying. A report of a joint research project of the Quartermaster General's Office, U.S. Army, and the University of California.**—*Fruit Prod. J.*, xxv, 5, pp. 140–141, 155, 1946.

No living yeasts or moulds were found to be present on prunes [*R.A.M.*, xxv, p. 509] at the end of commercial dehydration, even though initial dipping and washing procedures not only fail to remove the contaminants but may even cause a rise in their numbers. Sun-drying also does not kill the yeasts on fresh prunes and may be responsible for a temporary increase in their incidence. Grading and handling after dehydration are further channels of recontamination, which may be extremely heavy where plant sanitation is defective.

KAPUR (A. P.). **Combined spraying trials against the San José scale and Peach leaf-curl in Kashmir.**—*Bull. ent. Res.*, xxxvii, 1, pp. 29–32, 1946.

In a combined spraying experiment at Khudwani, Kashmir, in the early spring of 1944, for the control of the two most important local parasites of the peach, namely, San José scale (*Quadraspidiotus perniciosus*) and leaf curl (*Taphrina deformans*), six blocks of six 15-year-old trees were sprayed with (1) boiled soap diesel-oil emulsion, (2) Bordeaux mixture 5–5–50, followed on the fifth day by (1), (3) stock solution of (1) diluted in (2), (4) Bordeaux mixture 4–4–50–emulsified diesel oil, and (5) Bordeaux mixture 5–5–50, (6) being left untreated. The percentage of leaf curl in block (1) was 12·1, in (2) 5·1, in (3) 6·1, in (4) 5, in (5) 4·6, and in (6) 32. The best joint control of the two parasites was secured by treatment (4).

GERRITSEN (J. D.). **Vragen rondom de bladvalziekte van de Roode Bes.** [Problems connected with the Red Currant leaf spot disease.]—*Tijdschr. PlZiekt.*, lii, 4, pp. 119–120, 1 fig., 1946. [English summary.]

Pseudopeziza ribis is prevalent on red currants in all parts of Holland [*R.A.M.*, xii, p. 705; xv, p. 448], assuming such a virulent form in some seasons that the bushes are defoliated by July; the resultant weakness is reflected in poor vegetative growth and a light crop. White and black currants and gooseberries are also liable to infection by the leaf spot, though less susceptible than the red varieties. Among the last-named, Fay's Prolific, Versailles, and Laxton No. 1 are very susceptible, while German Sour (Prince Albert) and Erstling aus Vierlanden are reasonably resistant. Control may be effected by spraying with Bordeaux or some other copper-containing mixture before flowering or after picking or at both times.

Besides *P. ribis*, *Mycosphaerella ribis* [*M. grossulariae*: ibid., xxv, p. 266] causes similar symptoms on the same hosts. The latter pathogen is supposed to be less widespread than the former, but exact data as to their relative distribution are lacking. The question of physiologic specialization within *P. ribis* also requires elucidation, and further trials are necessary to determine the correct dates for the application of protective fungicides to the bushes.

BOHN (G. W.) & MALOIT (J. C.). **Bacterial spot of native Golden Currant (Ribes aureum).**—*J. agric. Res.*, lxxiii, 7–8, pp. 281–290, 3 figs., 1946.

The authors describe the defoliating bacterial leaf spot of golden currant (*Ribes aureum*), and the morphology, cultural characteristics, habitat, and taxonomy of the causal organism *Pseudomonas ribicola*, inoculation experiments with

which have been previously reported [*R.A.M.*, xxv, p. 349]. This is believed to be the first record of a bacterial disease of currants.

The leaf spots are usually 2 to 4 mm. in diameter, but isolated spots are frequently larger. They are round, or if near the large veins, irregular. Well-developed spots have dark brown, slightly concave centres, and reddish-brown, water-soaked, slightly raised margins, with either a narrow halo with a distinct, entire or minutely wavy edge or a broad halo with an indistinct edge. Under some conditions the margins merge into slightly raised, dark green, water-soaked areas with irregular, indistinct edges. Small veins within spots are coloured reddish-brown and shrivelled.

Infection of the young leaf causes distortion and tearing; leaves with several spots turn various shades of yellow and red with green zones remaining round the spots. Severely spotted leaves soon turn brown, dry, and drop. At Cheyenne, Wyoming, leaves developing on new shoots later in the season are usually unaffected. Spots on the stems rarely kill the shoots; fruit spots are small, raised, and brown, causing deformity, premature ripening, and some loss in yield which is probably reduced also by defoliation.

A white bacterium, obtained in apparently pure culture from all spots, was used in pathogenicity tests in the field, greenhouse, and laboratory. Six isolates were all virulently parasitic on leaves of *R. aureum* [loc. cit.], and all were recovered in pure culture from inoculated leaves and found identical with the parent cultures. The bacterium is motile and rod-shaped, occurring singly, in pairs, or in chains having cross walls difficult to distinguish even in stained mounts. The dimensions in non-flamed, nigrosin mounts varied from 0·9 to 1·7 by 0·4 to 0·9 μ. The bacterium is Gram-negative and not acid-fast. It is a facultative anaerobe, with a minimum temperature for growth less than 3·5° C., a maximum between 30° and 32·5°, and an optimum from 20 to 25°. The pH tolerance is greater than the range 5·6 to 7·5, the optimum being 7. Gelatine is liquefied slowly or not at all; milk is not coagulated but rendered more alkaline; slight acid is produced from carbohydrates.

POWELL (D.). **Copper 8-quinolinolate, a promising fungicide.**—*Phytopathology*, xxxvi, 7, pp. 572–573, 1946.

In glass-slide tests 8-quinolinol [*R.A.M.*, xxv, p. 465] and its copper derivative were highly toxic to *Sclerotinia fructicola*, having an LD 50 range of less than 1·5 microgm. per sq. cm. slide [cf. ibid., xxiii, p. 35]. Chlorine substitutions on the 5 and 7 positions of these parent compounds decreased toxicity to an LD 50 of 50 and 200, and bromine substitutions to 400 and 1,200 microgm. per sq. cm., respectively. In 1945 these materials were used in field tests in Illinois for apple scab [*Venturia inaequalis*] and blotch [*Phyllosticta solitaria*] control in comparison with ½ pt. per 100 gals. water puratized N5–E (10 per cent. phenyl mercuri triethanol ammonium lactate), 1 pt. isothan Q 15 (20 per cent. lauryl isoquinoline bromide), 1 pt. isothan Q 32 (20 per cent. cetyl isoquinoline bromide), 1 lb. fermate [cf. ibid., xxv, p. 398], and 1 lb. copper 8-quinolinolate, each per 100 gals. The treatments were applied to 30-year-old Duchess trees on 27th April, 9th and 23rd May, 1st, 11th, and 22nd June, and 11th July; of these the first comprised only the several fungicides, while the rest were supplemented by 3 lb. each of lead arsenate and lime per 100 gals. water, except that lime was omitted from the fermate-containing sprays.

The fungicidal efficacy of 8-quinolinol in the laboratory was not maintained in the field, where it was, in fact, inferior to all the other compounds tested, permitting the development of 40·7 per cent. scab and 86·2 per cent. blotch, compared with 37·8 and 0·1 for fermate, 17·3 and 0·7 for copper 8-quinolinolate, 11·1 and 7·9 for puratized N5–E, 38·9 and 54 for isothan Q 15, and 42·3 and 66·1 for isothan Q 32. None of the materials tested caused injury. The copper 8-quinolinolate therefore shows considerable promise as a fungicide.

Zentmyer (G. A.) & Klotz (L. J.). **Microorganisms in Avocado tree decline.**—*Calif. Citrogr.*, xxxi, ii, pp. 436–437, 1946.

After pointing out that there have been indications recently that *Phytophthora cinnamomi* may play some part in avocado decline in California [*R.A.M.*, xxv, p. 70] the authors state that experimental evidence demonstrated that waterlogging the soil, regardless of the type of microflora present, for 10 to 14 days resulted in serious injury to seedling avocado roots, even in soil initially sterilized with chloropicrin or by autoclaving, while waterlogging in the presence of *P. cinnamomi* resulted in even worse injury and the death of the roots and tops. Duration of waterlogging was very important. When the soil was saturated for periods of two to four days, no injury resulted. When the waterlogging persisted for six to eight days injury resulted in the presence but not in the absence of *P. cinnamomi*. That soil temperature was also a factor was indicated by the fact that seedlings declined even in sterilized soil after short periods of waterlogging at 32° C.

In an experiment in the Wisconsin temperature tanks, soil inoculation with *P. cinnamomi* and the use of soil from affected areas containing *P. cinnamoni* and other micro-organisms resulted in root injury even without excess water.

At each of five soil temperatures used the seedlings in sterile soil at field [moisture-holding] capacity or less made the best growth and had the largest and healthiest roots. Using an arbitrary figure for root area, the seedlings in sterile soil at field capacity or less showed an average root area represented by 921; for sterile soil at field capacity or less inoculated with *P. cinnamomi* the figure was 222; for waterlogged sterile soil 415; for non-sterile soil at field capacity or less 223; the figures for waterlogged, non-sterile soil and inoculated soil were slightly lower. The figures for weights of roots and for increase in height followed a similar trend.

These and other results indicate that *P. cinnamomi* when present may accelerate decline, but that decline does not depend on the presence of the fungus alone. Toxic products formed by bacteria and other micro-organisms under anaerobic conditions also play a part. These include nitrite (also produced by *P. cinnamomi*), butyric acid, and hydrogen sulphide. These products, and consequently root injury and decline, increase in soils whose carbohydrate content has been increased by the addition of sugar.

Pflanzenschutzmittel zur Bekämpfung von Krankheiten und Schädlingen im Feld-, Obst-, Wein- und Gartenbau. [Plant-protectives for the control of diseases and pests in agriculture, fruit-growing, viticulture, and horticulture.]—29 pp., Eidgenössische Versuchsanstalt für Obst-, Wein- und Gartenbau, Wädenswil, Zürich, 1944. [Received December, 1946.]

This pamphlet falls into two parts, of which the first deals with plant-protectives for the control in Switzerland of diseases and pests of (*a*) field crops and (*b*) fruit trees, vines, and horticultural plants, while the second furnishes lists of (*a*) authorized plant-protectives, arranged in groups according to their active ingredients, (*b*) the names and addresses of the firms supplying them, and (*c*) the same preparations in alphabetical order.

Pflanzenschutzmittel-Verzeichnis 1946. Mittel gegen Pflanzenkrankheiten, Schädlinge und Unkräuter im Feld-, Obst-, Wein- und Gartenbau. Offizielle Liste der bewilligten Kontrollmittel 1946. [List of plant protectives 1946. Remedies against plant diseases, pests, and weeds in agriculture, fruit-growing, viticulture, and horticulture.]—36 pp., Eidgenössische Versuchsanstalt für Obst-, Wein- und Gartenbau, Wädenswil, Zürich, 1946. [French translation.]

The plant-protectives officially sanctioned for the control of plant diseases and pests in Switzerland are listed (*a*) in groups according to their active ingredients,

with indications as to their several purposes and the names of the manufacturers, and (*b*) in alphabetical order.

Brues (C. T.). **Insect dietary.**—x+466 pp., 22 pl., 68 figs., Cambridge, Massachusetts, Harvard University Press (London, Geoffrey Cumberlege, Oxford University Press), 1946. 28*s*.

In this book, the Professor of Entomology at Harvard University gives a full account of the relationship between insects and their environment through the medium of their food, showing how their search for food has affected their development and that of numerous animals and plants. The work is divided into ten chapters (each accompanied by an extensive and valuable bibliography) dealing, respectively, with the abundance and diversity of insects, types of food habits, herbivorous insects, gall insects, fungi and microbes as food and symbiosis, predatory insects, parasitism, blood-sucking insects and other external parasites, entomophagous and other internal parasites, and, finally, insects as food for man and other organisms. There are interesting references (p. 193 *et seq.*) to fungi as food for certain insects, e.g., yeasts, *Mucor*, and *Penicillium* spp. and (p. 206 *et seq.*) an account of commensal associations between insects and fungi, e.g., between the scale insect *Aspidiotus osborni* and *Septobasidium retiforme*. Fungal diseases of insects also receive mention (p. 412 *et seq.*).

Moore (W. C.). **Seed-borne diseases.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 228–231, 1946.

The dangers associated with the uncontrolled movement of diseased seed were unquestionably increased by war-time problems of seed supply. Before the war no international standard existed for the certification of seed for export as free from disease or for preventing its entry unless so certified. Some governments, including the British, allowed unrestricted entry of seeds; others required certificates of health for certain specified seeds or for all; and a few had special regulations. South American countries required certificates for all seeds; the United States only for those of trees, shrubs, and sweet peas; and the Dutch East Indies for all seeds not included in a long free list.

When a certificate is required by an importing country for British seed it is sampled by inspectors of the Ministry of Agriculture, and tested at the Plant Pathological Laboratory, Harpenden. If it passes the tests, the stocks from which samples were taken can be drawn upon without further testing; rejection entails that of the whole stock. Approved seed then qualifies for the Ministry of Agriculture's certificate stating that on a certain date it was 'found, or believed to be, free from injurious plant diseases and dangerous insect pests'. Between 1925 and 1943 nearly 30,000 such samples were examined at Harpenden, and of these the great majority were flower seeds, the rest mainly vegetables, with a few cereals; 650 were rejected on the ground that they carried parasitic organisms. These mostly consisted of peas, celery, and parsley, 27 per cent. of the peas being infested by *Ascochyta* spp. [*A. pisi* and *A. pinodella*], or showing symptoms of marsh spot [manganese deficiency]; 42 per cent. of the celery with *Septoria* [*S. apii-graveolentis* and *S. apii*], and 31 per cent. of the parsley with *S. petroselini*.

The number of seed samples received for certification dropped almost to zero during the war. It was, however, necessary to watch carefully for new diseases which might have entered the country on or in imported seed. Bacterial canker of tomato (*Corynebacterium michiganense*) [*R.A.M.*, xxiii, p. 193], a disease primarily seed-borne and first recognized in Britain in 1942, was the cause of 10 outbreaks in 1943. Six of these were traced to the same source of seed, imported from a country where the disease was well known. Further distribution of seed was prevented by official action and the outbreaks effectively checked. Although

the disease did not reappear in the infected nurseries, the number of fresh cases reported elsewhere by November, 1945, had reached 31. Under glass there appears to have been little damage to the crops, but in 10 of the 26 field outbreaks loss was moderate to severe. It does not follow, however, that all the outbreaks of *C. michiganense* began in this way and the disease may have been present here to some extent under glass before the war.

Seed-testing is not regarded as in itself a particularly effective method of controlling seed-borne diseases, in view of the large number of seed-borne parasites and the many ways in which they can be carried, often impossible to detect merely by examining or even germinating the seed. If the problem is to be tackled seriously, more information is needed concerning the extent to which diseases, especially those of vegetables and flowers, are seed-transmitted, the morphology and biology of seed infection, the behaviour of the pathogens during seed dormancy, and the factors underlying the often baffling occurrence and appearance of a disease in crops raised from infected seed.

Certification of healthy seed crops in the field seems at present to offer the only solution for obtaining stocks free from viruses and those bacterial and fungal diseases which are carried internally in the seed. Even so, there may be ample opportunity for subsequent infection to occur during harvesting or threshing or in store. Thus, different avenues of approach must be regarded not as alternatives, but as mutually complementary. An ideal might well be field inspection and certification, followed by scientific harvesting and handling and, if necessary, seed treatment, and finally by seed-testing in which just as much importance is attached to freedom from disease as to purity and vitality.

Proceedings of the Association of Applied Biologists.—*Ann. appl. Biol.*, xxxiii, 2, pp. 231–244, 1946.

At the Annual General Meeting of the Association of Applied Biologists, 1946, the official scheme for the approval of proprietary products for the control of plant pests and diseases was discussed.

In the first paper H. Martin reviewed past attempts to establish such a scheme, the difficulties encountered, and the steps taken officially, which have resulted in the Ministry of Agriculture putting the present voluntary scheme into operation in October, 1942 [*R.A.M.*, xxii, p. 71].

J. T. Martin described the provisions and administration of the scheme. It is concerned only with those preparations (not of secret composition) usually available in Great Britain for the control of pests and diseases of growing crops, and is open to all British manufacturers and to foreign firms with agents resident in the country. An approval mark guarantees the products under the conditions of the scheme and lists of approved products are issued periodically [ibid., xxiii, p. 237]. The basis of approval of products is the conformity to an accepted specification or the evidence of efficiency; certificates of approval valid for one year are issued and may be renewed annually. So far 180 products in 18 groups have been approved. The scheme, which provides guidance to the purchaser of insecticides and fungicides without legislation or testing of the products, should eventually become fully established.

Speaking as a manufacturer, J. R. Booer summed up the advantages and disadvantages from his point of view. He said that the scheme had improved the liaison between the Ministry, the advisory officers, and the manufacturers. He thought, however, that it would not attain its full value until there was available an approved product against every insect pest and fungus disease with which growers have to contend, and controllable by chemical means.

W. A. R. Dillon Weston, as a specialist advisory officer, showed how the scheme worked for organo-mercury seed dressings, of which eight have been

approved [ibid., xxii, p. 128; xxiii, p. 434, *et passim*]. He suggested that for the guidance of the grower the percentage composition of each should be disclosed, and that it might be advisable to approve such dressings only after field tests had demonstrated that they controlled seed-borne diseases adequately.

O. G. DOREY, representing the growers, deplored the lack of publicity for the scheme and the approval of products without independent or official analysis.

STANILAND (L. N.). **Simple laboratory and field apparatus for the production of accurate line drawings to scale.**—*Ann. appl. Biol.*, xxxiii, 2, pp. 170–177, 6 figs., 1 graph, 2 diags., 1946.

An apparatus is described with which accurate scale drawings of developmental changes in plants or other biological material can be made. A vertical sheet of clear glass is set up with a pin-hole 'peep-sight' on one side and the object to be drawn on the other. The object viewed through the sight can be outlined accurately with pen and Indian ink on the glass surface. The use of the sight eliminates parallax effects. The apparatus can be used in conjunction with a lens where magnification is required.

TURNER (J. S.), MCLENNAN (E. I.), ROGERS (J. S.), & MATTHAEI (E.). **Tropic-proofing of optical instruments by a fungicide.**—*Nature, Lond.*, clviii, 4014, pp. 469–473, 3 figs., 1946.

Problems presented by the liability of optical instruments to fungal attack during military operations in New Guinea [*R.A.M.*, xxiv, p. 379; xxv, p. 515], where the warm and humid conditions are ideal for the development of fungus infection, led to an investigation by a sub-committee of the Australian Scientific Instrument and Optical Panel. *Penicillium spinulosum, P. commune, P. citrinum, Aspergillus niger, Trichoderma viride, Mucor racemosus*, and *M. ramannianus* were frequently isolated from instruments supplied to New Guinea. An etched pattern may appear on the glass if the mycelium remains for several months in contact with it. Usually, on removal, the mycelium leaves only a slight stain resembling an oil film. This can be erased by cerium oxide polishing.

It was decided that a volatile fungicide suitable for introduction into the instrument during its first re-servicing and fitting with graticules should fulfil the following requirements: toxicity to all possible contaminants; action at a distance (volatility), as the substance cannot be placed directly on the optics; stability in moist air and up to a temperature of 60° C.; persistence of action over several months or years; inability to corrode metals; non-toxicity to man; repellence to mites; and availability in war-time. Inability to satisfy one or both of the first two foregoing requirements when incorporated in luting wax and tested against mixed spores led to the rejection of a number of fungicides, of which only thymol was at all promising.

Acting upon a suggestion by V. M. Trikojus, it was found that sodium ethylmercurithiosalicylate, used by the Australian Army Medical Corps for preserving blood and referred to as 'M.T.S.' [merthiolate: cf. ibid., xix, p. 275], completely suppressed all the fungi concerned. Dry merthiolate is scarcely volatile, but in the presence of water vapour it undergoes decomposition, to give a very active fungicidal and fungistatic vapour. Subsequently it was mixed with black lacquer to give a concentration of 0·2 per cent. in the liquid and used to cover the interior metal surfaces of optical instruments; it was also incorporated in the microcrystalline wax used for luting purposes.

The butyl and methyl esters of merthiolate were less satisfactory in the Australian experiments, but Hutchinson found the butyl ester more effective in the Panama zone than merthiolate itself, and this ester, in view of its solubility in lipoid solvents, may supersede eventually the sodium salt.

Used in aqueous solutions, merthiolate causes rapid corrosion of aluminium and slight corrosion of brass, but when incorporated in a suitable lacquer (nitro-cellulose is recommended) the metal is fully protected. As a precaution against corrosion, merthiolate has also been incorporated into the zinc-oxide-retinax grease used as a lubricant. Several thousand optical instruments have now been tropic-proofed and no report of corrosion has been received from the Services.

In 1944, 350 badly sealed United States aircraft cameras were reported as being severely damaged by fungal attack. After treatment with fungicidal lacquer no further attacks occurred. The internal painting of the fibre camera cases inhibited fungal growth within them. The Royal Air Force are testing merthiolate in Britain, where it is recommended that the internal metal surfaces should be anodized or covered with a primer before the treated lacquer is applied.

Another suggested use of merthiolate is against mould-spotting of framed prints, and it may repay investigation by technical officers in museums and galleries.

EMERSON (R. L.), WHIFFEN (ALMA J.), BOHONOS (N.), & DE BOER (C.). **Studies on the production of antibiotics by Actinomycetes and molds.**—*J. Bact.*, lii, 3, pp. 357–366, 2 graphs, 1946.

From 239 United States soil samples, 221 cultures of moulds and 1,007 of Actinomycetes were tested by the streak plate method against a number of bacteria and fungi pathogenic to man. Some 50 per cent. of the cultures produced inhibitory substances, and 37 moulds and 107 Actinomycetes showing promise in the first series of tests were studied further in shaker flasks for their action on *Escherichia* [*Bacterium*] *coli* and *Staphylococcus albus*, while 58 Actinomycetes and 35 moulds were used in experiments with *Cryptococcus hominis* [*C. neoformans*]. Ten moulds and 80 Actinomycetes produced culture fluids inhibiting the growth of *Bact. coli*, the corresponding figures for activity in respect of *S. albus* being 13 and 101, respectively. The development of *C. hominis* was arrested by the culture liquids of all but one of the 58 Actinomycetes tested, and by all but two of the 35 moulds.

CARVAJAL (F.). **Studies on the structure of Streptomyces griseus.**—*Mycologia*, xxxviii, 5, pp. 587–595, 3 figs., 1946.

An account is given of studies made by the author with light and electron microscopes on the structure of active and inactive strains of *Streptomyces griseus* [see next abstracts] and other Actinomycetes. The observations on *S. griseus* deal with the mycelium, spore formation, spore germination, and the nucleus. The spores may be oval, spherical, cylindrical, or bean- or barrel-shaped, and are borne exogenously in chains on the aerial mycelium. They usually germinate at one or both ends.

CARVAJAL (F.). **Biologic strains of Streptomyces griseus.**—*Mycologia*, xxxviii, 5, pp. 596–607, 4 figs., 1946.

Only a few strains of *Streptomyces griseus* (formerly referred to as *Actinomyces griseus* [*R.A.M.*, xxiv, pp. 165, 426]) isolated from soil, river mud, insects, plant roots, air, foodstuffs, animal excreta, decomposing plant material, and dust were found to produce streptomycin [ibid., xxv, p. 308], and these varied greatly in their ability to do so. When *S. griseus* strains were streaked at the same time perpendicularly to bacterial testers they were partially inhibited by *Staphylococcus aureus*, *Bacillus subtilis*, and *E*[*scherichia*: *Bacterium*] *coli*. Colony variation occurred among colonies derived from the same isolate. The stability of the cultures was improved by smearing the whole surface of the medium with a heavy suspension of spores. Lyophilized cultures of active strains of *Streptomyces griseus* did not differ from the parent cultures in morphological, physiological, or biochemical characters.

WAKSMAN (S. A.), REILLY (H. CHRISTINE), & JOHNSTONE (D. B.). **Isolation of streptomycin-producing strains of Streptomyces griseus.**—*J. Bact.*, lii, 3, pp. 393–397, 1946.

From the results of a study at the New Jersey Agricultural Experiment Station of eight strains of *Streptomyces griseus* [see preceding abstracts] it was concluded that not all are capable of producing streptomycin [*R.A.M.*, xxvi, p. 18]; streptomycin-producing strains form active and inactive variants, the latter comprising two types, one free from aerial mycelium and the other developing a pink tinge in the vegetative growth, the aerial mycelium being typical of *S. griseus*; a medium enriched with streptomycin can be used for the isolation of fresh strains of the organism from natural substrata and also for the purification of active from inactive variants.

GAUSE (G. F.). **Litmocidin, a new antibiotic substance produced by Proactinomyces cyaneus.**—*J. Bact.*, li, 6, pp. 649–653, 1946.

An actinomycete named *Proactinomyces cyaneus* var. *antibioticus*, isolated from south Russian soil, was found to produce a substance, designated litmocidin, which exerts a powerful bacteriostatic action on *Staphylococcus aureus*, *Streptococcus haemolyticus*, *Vibrio comma*, and *Mycobacterium tuberculosis* in the presence of blood serum. It did not, however, prevent the development in mice of septicaemia caused by a strain of *Staphylococcus* very susceptible to litmocidin *in vitro*.

BRAZHNIKOVA (Mme M. G.). **The isolation, purification, and properties of litmocidin.**—*J. Bact.*, li, 6, pp. 655–657, 1946.

Litmocidin, the new antibiotic produced by *Proactinomyces cyaneus* var. *antibioticus* [see preceding abstract], has been isolated and purified. It was found to possess a constant melting-point at 144° to 146° C. It is a pigment, having many features in common with plant anthocyanins, and can be obtained in two forms, one acid (red) and the other alkaline (blue), with different solubilities in water. Both forms inhibit the growth of *Staphylococcus aureus* in a dilution of 1 in 4,000,000.

MCAULAY (A. L.), PLOMLEY (N. J. B.), & FORD (J[OAN] M.). **Saltants produced in the fungus Chaetomium globosum by monochromatic ultra-violet irradiation and a growth effect characteristic of wavelength.**—*Aust. J. exp. Biol. med. Sci.*, xxiii, 1, pp. 53–57, 2 figs., 1945.

Saltations involving modifications of the growth-rate and form, mycelium, and perithecia of *Chaetomium globosum*, as well as an alteration in the growth-type, designated 'K', have been induced by monochromatic ultra-violet irradiation. The mycelium produced by the irradiated spores frequently shows instability and a capacity for development into more than one colony type, this feature being particularly marked in the 'K' sectors. For equal lethal effects of the irradiation the production of 'K' sectors amounts to 31·3 per cent. at 265 mμ, but less than 5 per cent. at 313 and 334 mμ, whereas saltant production is independent of wave-length.

FORD (JOAN M.). **Morphological, inheritance and growth studies of the K saltation produced selectively by short wavelengths of ultra-violet irradiation in the fungus Chaetomium globosum Kunze (Ascomycetes, Sphaeriales).**—*Aust. J. exp. Biol. med. Sci.*, xxiv, 3, pp. 241–250, 5 figs., 3 graphs, 1946.

Distinctive features of the 'K' growth-type modification induced in *Chaetomium globosum* by short-wave ultra-violet irradiation [see preceding abstract] include arrested development at the edge of the colony, the production of a brown pigment

insoluble in water, ether, alcohol, and xylol, belated 'flares' of surface and aerial mycelium, and the formation outside the brown zone of white knots of mycelium, which subsequently give rise to numerous perithecia. As many as six 'K' sectors (another three are reported in a footnote) alternating with normal ones have been observed in one colony developing from an irradiated spore. The 'K' instability can always be reproduced from certain areas of the mycelium, and in a number of cases has been carried through several generations of spore subcultures. It is now thought justifiable to designate this instability as a saltant change.

Newton (W.). **The growth of Sclerotinia sclerotiorum and Alternaria solani in simple nutrient solutions.**—*Sci. Agric.*, xxvi, 7, pp. 303–304, 1946.

This study of the growth of *Sclerotinia sclerotiorum* and *Alternaria solani* in simple nutrient solutions was undertaken to establish a standard nutrient solution that contained only essential basic constituents. The experiment was based on a simple mineral-dextrose solution, consisting of a mixture of potassium hydrophosphate, potassium nitrate, and dextrose, no measurable growth being obtained when the sugar or any of the constituent ions of these compounds was omitted. When *S. sclerotiorum* and *A. solani* were grown in this basic medium the dry weights of the mycelia progressively increased with the successive additions of the ions magnesium, sulphate, and calcium. The replacement of nitrate by ammonium considerably inhibited the growth of *A. solani*. Although inferior to nitrate, asparagin was a good source of nitrogen for both fungi.

Plant diseases. Notes contributed by the Biological Branch. Armillaria control. Squirter and black-end disease of Bananas.—*Agric. Gaz. N.S.W.*, lvii, 4, pp. 177–180, 6 figs., 1946.

It has been found possible to kill *Armillaria mellea* infecting the roots of citrus trees by removing the soil to expose the roots, thus causing the fungus to dry out. Infected trees can be maintained in production for years after this treatment and subsequent manuring and careful attention. The rapid removal of the soil from the crown roots and base of the trunk has been accomplished by means of a jet of compressed air, applied by a pneumatic drill air-compressor through two 60-ft. hoses, each with a 6-ft. rod equipped with a pistol-grip shut-off. The soil is blown away in short blasts, this being more effective in action owing to the build-up of pressure, and more economical in petrol consumption, than a continuous jet. Sixteen trees (or thirty planted 24 × 12 ft.) can be treated from one position, and experienced workers can clear dry, infested soil from about 150 trees a day, or from about 80 in wet soil. Hire of the machine from the Erina Shire Council, with the maintenance engineer, costs 30*s.* per day; petrol consumption varies, according to soil conditions and the operator's skill, from 6 to 12 gals. per day. In any case it is more economical than if done by hand, is less laborious, is speedier, and entails no damage to the roots. It is probably efficacious only for light soils but these are the only ones where pathogenic activity is serious.

The causes and symptoms of squirter disease of bananas (*Nigrospora sphaerica*) and black-end (*N. sphaerica*, *Gloeosporium musarum*, and *Fusarium* spp.) [*R.A.M.*, xxi, p. 31] are described, together with control measures.

Scottish Society for Research in Plant Breeding. Report (abridged) by the Directors and Report of the Director of Research to the Annual Meeting, 18th July, 1946.—41 pp., 1946.

Included in this report of the Director of Research [cf. *R.A.M.*, xxii, p. 447] are the following items of phytopathological interest. W. Black and J. C. Haigh (p. 12) report that a necrotic reaction to potato virus Y has been found in certain wild potato species from Mexico and Central America, on which breeding work is

now in progress, and additional material has been obtained which may assist the production of varieties resistant to this virus.

G. Cockerham and T. M. R. M'Ghee (p. 17) have studied the hypersensitive reactions of E.P.C. 4 (a variety of *Solanum demissum*), *S. simplicifolium*, and their seedling progenies towards potato virus Y and have shown that this character has in all probability the value of field immunity, at least in older plants, although in newly emerged plants several lethal systemic infections followed the feeding of infectious aphids. The progeny tests suggest that the character is hereditary, although the actual mode of inheritance is not yet clear [ibid., xxv, p. 228].

Investigations were carried out on the effect of virus Y on seedling progenies of varieties which show leaf-drop streak when infected with this virus and which are killed, and therefore field-immune, when infected with the C strain of virus Y [ibid., xxiii, p. 404]. The results indicate that the two reactions are probably related, and that field immunity from virus Y might be secured by replication of the gene conditioning field immunity from strain C through selective breeding within the range of the cultivated varieties.

Vasudeva (R. S.) & Lal (T. B.). **Studies on the virus diseases of Potatoes in India. II. Solanum virus 2 (Orton).**—*Indian J. agric. Sci.*, xv, 5, pp. 240–242, 2 pl., 1945.

Continuing their studies on potato virus diseases in India [*R.A.M.*, xxiv, p. 334; and cf. xxvi, p. 45] the authors isolated in a pure form *Solanum* virus 2 (potato virus Y) from Phulwa potato plants showing either negligible mosaic and veinal necroses or severe mosaic only. The varieties Gola, Majestic, President, Windsor Castle, and Talisman (Up-to-Date) showing the same symptoms followed by acropetal necrosis and all the Phulwa plants except a few, showing negligible mosaic and veinal necroses, gave a mixture of potato virus Y and *Solanum* virus 1 [potato virus X]. Virus Y was isolated by passage of the complex through *Petunia hybrida*. The symptoms shown by plants of some of the varieties from which virus Y was isolated are described, as are all the reactions of the pure isolate on certain differential plants (Harrison's Special and White Burley tobacco, *Nicotiana glutinosa*, *N. sylvestris*, *N. rustica*, *Datura stramonium*, *Solanum nodiflorum*, *P. hybrida*, and President potato). The virus rapidly lost activity after exposure to 50° C., and at 54° it became innocuous. It was inactivated also by dilution to 1 : 1,000 and by storage (of standard extract) for 24 hours at room temperature. It was held back during passage through Chamberland filters (L to L 5).

Milbrath (J. A.). **Green dwarf : a virus disease of Potato.**—*Phytopathology*, xxxvi, 8, pp. 671–674, 2 figs., 1946.

Green dwarf, a disease of potatoes hitherto undescribed, and not yet a source of serious loss, has been known in Oregon for several years. It is caused by a virus apparently distinct from other potato viruses and as it is often found in fields set apart for tuber production, it is probable that the disease has a wider, but unrecognized, distribution. Green dwarf, tuber-perpetuated, has been found in fields of Netted Gem potatoes grown from Montana seed.

The characteristic symptoms are late emergence and severe dwarfing. A mature plant may attain a height of only 6 in. The apparently normal basal leaves are bunched in a rosette of four or five leaves. The terminal growth is dwarfed and distorted, and the growing point constricted into a cluster of small leaves. Upward cupping of the young leaves occurs. The plants may be rather darker than normal; the tubers are small but show no other symptoms.

In the greenhouse the symptoms differ considerably from those of field-grown plants. Emergence is one to two weeks late, a dark, leafy bud develops slowly, and the older leaves spread into small structures, of a uniform dark green, often

only 1 to 2 in. long. The plants are very stiff and erect, and the growing point remains compact or constricted. Green Mountain plants, from tubers inoculated the previous year with the virus, after two months' growth, produced blossom clusters on 6-in. high plants, with a leaf-spread not more than 2 in. The White Rose variety and some others, after late emergence and slow development, produced fairly normal plants 12 to 18 in. tall. Natural infection in the field causes only local dwarfing in the terminal region during the current season's growth.

The disease has been readily transmitted in five varieties by stem-grafting.

The virus seems to pass slowly through the host, as tubers from newly infected plants may not all produce diseased plants, and tubers cut in pieces and planted as a unit may give only one green-dwarf plant per unit. Although most fields show only 1 per cent. disease, the considerable spread noted during the 1945 season gave much concern to growers of certified seed in those areas.

SAMUEL (G. G.). **Some precautions for Potato clamping.**—*J. Minist. Agric.*, liii, 7, pp. 312–313, 1946.

During 1946 potato blight [*Phytophthora infestans*] appeared in June both in Lincolnshire and south-western England. The continued wet weather in July and August favoured a slow, steady spread of infection, and the lack of warmth retarded the destruction of the haulms. A long sporulating period resulted and heavy rains caused much tuber infection. Haulm destruction by chemical spraying was consequently too late in many fields.

Care must be taken when building clamps to ensure that affected tubers are kept out, and tubers should go into the clamps dry. When wet clamping is unavoidable they can often be dried fairly well during the sweating period. If the tubers are well covered with straw held in place by soil, the rise in temperature during sweating, together with effective ventilation, will help to dry them during the two or three weeks before they are earthed-up, when wet straw should be replaced by dry. If the tubers are wet when clamped, the size of the clamp should be reduced and it should be well ventilated at the top and base.

An epidemic of wet rots in seed potatoes in 1945 was found to have been due largely to insufficient allowance being made for the normal rise in temperature of newly lifted potatoes, ventilation being inadequate in trucks, in clamps that were closed too soon, and in heaps in permanent stores. If clean tubers, free from disease, are clamped in dry conditions, allowed to sweat properly before earthing-up, in a well-constructed, rain-proof clamp before the onset of the first serious frosts, storage troubles seldom occur.

EDDINS (A. H.), PROCTOR (E. Q.), & WEST (E.). **Corky ringspot of Potatoes in Florida.**—*Amer. Potato J.*, xxiii, 9, pp. 330–333, 1 fig., 1946.

Corky ring spot of potato tubers, known as spraing in England [cf. *R.A.M.*, xxiii, p. 40], was observed at Hastings, Florida, for the first time in crops harvested from three farms during April, 1946. The fields in which it occurred had a fine, sandy soil and had been used for potato-growing for more than 25 consecutive years, or, in one case, for cabbages for several years. The symptoms consisted of brown, concentric rings or sections of rings on the surface of the tubers. There was much cracking of the skin in the rings. Some tubers also showed growth cracks and shallow, irregular, corky depressions. The flesh beneath the surface rings in the affected parts was brown and showed the same ring-like patterns, the discoloration resembling that due to late blight [*Phytophthora infestans*] and sometimes becoming apparent on the surface. In severe cases, brown, corky areas and brown masses of starch grains were scattered throughout the flesh. No organism was obtained on potato dextrose agar from affected material. The authors con-

clude that corky ring spot is different from physiological internal necrosis [ibid., xxv, p. 275].

VAN BEEKOM (C. W. C.). **Rhizoctonia ziekte in Aardappelen en bemesting.** [*Rhizoctonia* disease in Potatoes and manuring.]—*Tijdschr. PlZiekt.*, li, 3, pp. 82–84, 1945.

Following up Quanjer's researches on the relation of manuring to the *Rhizoctonia* disease of potato [*Corticium solani*: *R.A.M.*, xxv, p. 228], the writer conducted an experiment with Eigenheimers in a field of reclaimed sand in south Holland to determine the effect of potash on the incidence of infection. In the autumn of 1942, after the application of the fertilizer in two consecutive years, the potash values for the plots of 0·36 are each [1 are = 100 sq. m.] receiving dosages of 100, 150, 200, and 250 kg. per ha. ranged from 34 to 46, compared with 22 for the untreated. In the spring of 1943 the same amendments were given, with the addition of nitrogen at the rate of 500 kg. per ha. before planting the potato crop. The number of diseased plants in the treated plots ranged from 10 to 15 compared with 66 in the control, clearly demonstrating the increase in susceptibility to *C. solani* consequent on the omission of potash from the fertilizer.

BLODGETT (F. M.) & STEVENSON (F. J.). **The new scab-resistant Potatoes, Ontario, Seneca, and Cayuga.**—*Amer. Potato J.*, xxiii, 9, pp. 315–329, 1946.

Descriptions are given of three scab [*Actinomyces scabies*] -resistant potato seedlings which have been tested in New York State from 1938 to 1944, inclusive. They are not at present recommended unreservedly, but may prove temporarily useful in localities where the disease is troublesome. Ontario, a late-maturing variety, gave the biggest yields; it is highly resistant to scab, and possesses some resistance to late blight [*Phytophthora infestans*] and wilt (*Fusarium solani* var. *eumartii*); its cooking quality is fair to good. Ontario (528–242) is a selection from the cross between Richter's Jubel and U.S.D.A. 44537 [*R.A.M.*, xxii, p. 175]. Cayuga was comparable in yield with Rural and Sebago. It produced a rather lower percentage of No. 1-size potatoes than the other scab-resistant seedling varieties or standard varieties (about 85, as compared with 90 per cent.), but is highly scab-resistant and shows some resistance to late blight and wilt. It appears to have the best cooking quality of the three. Seneca was lowest in total yield, but gave a higher percentage of No. 1 potatoes than Cayuga. It showed some resistance to late blight and wilt, but less resistance to wilt than Ontario. Seneca and Cayuga were both derived from the cross Hindenburg × Katahdin.

STEINMETZ (F. H.). **The incidence of common scab on Green Mountain Potatoes in soils at different pH levels.**—Abs. in *Phytopathology*, xxxvi, 8, p. 682, 1946.

A field which had lain fallow for several years was divided into plots the soil of which was so amended with lime (calcium carbonate) and finely divided sulphur as to give the following pH levels per plot: 4·5, 5, 5·5, 6, and 6·5, the amounts added in lb. per acre being, respectively, 2,000 (sulphur), 1,000 (sulphur), 0, 2,000 (lime), and 4,000 (lime). One series of these treated plots received 600 lb. sulphur per acre. All these amendments were applied once in the spring just before planting the first Green Mountain potato crop [*R.A.M.*, xxv, p. 78]. The crop failed the first year on the plots which had received 2,000 lb. sulphur, and was suppressed on those which had had 1,000 lb. All plots were free from scab [*Actinomyces scabies*]. After the second potato crop the suppressing effects of the sulphur were not marked. Those plots which received 600 lb. sulphur produced good yields without scab each year. After 10 years the increase in scab was in direct relation

to the increase in the pH level above 5·5. At present the plots with the original pH levels adjusted to 6·0 and 6·5 produce non-marketable scabby potatoes.

MOL (J.) & ORMEL (H. A.). **Enkele opmerkingen over poederschurft Spongospora subterranea Wallr.** [Some observations on powdery scab *Spongospora subterranea* Wallr.]—*Tijdschr. PlZiekt.*, lii, 1, pp. 18–22, 2 pl., 1946.

A severe outbreak of powdery scab of potatoes (*Spongospora subterranea*), hitherto reported from Holland [*R.A.M.*, vi, p. 462] only in an innocuous form, occurred at Overijssel and Drenthe in 1943 on the Bintje and Geelblom varieties. In some fields over 50 per cent. of the tubers were infected, and the rot increased substantially during storage, so that by the following spring extensive decay had set in. *Fusarium* spp. predominated in the isolations from the sunken, pale- to dark-coloured rings, 5 to 7 mm. or more in diameter, surrounding the powdery scab spots proper in a large batch of Bintje tubers.

The diagnosis of powdery scab is facilitated by the development of spore balls between the cork layers [ibid., ix, p. 264]. In some of the tubers examined these structures had not yet appeared by the middle of October, whereas sections through others from the same consignment disclosed as many as eighty.

OTIS (C. E.). **The killing of Potato tops with chemicals in Oregon.**—*Amer. Potato J.*, xxiii, 9, pp. 333–336, 1946.

After briefly reviewing the reasons for killing potato haulms with chemicals before they mature [cf. *R.A.M.*, xxiii, p. 452] and the factors that affect rapidity of killing, the author states that dust applications are not recommended for eastern Oregon because of the low atmospheric humidity that prevails locally. For other areas, of three dusts found to be effective, copper sulphate (40 to 50 lb. per acre) was the slowest and least satisfactory, but it will kill if the prevailing conditions are warm and humid. Calcium cyanamide (40 to 50 lb. per acre) is effective when used in favourable climatic conditions. Sinox (15 per cent., 30 to 35 lb. per acre) [ibid., xxiv, p. 113] was the most phytocidal of the dusts tested, but its effect also depends on humidity and temperature. Of the sprays tried, ammonium thiocyanate (40 to 50 lb. per acre in solution) has a fertilizing effect. Used as a spray, copper sulphate should be applied at the rate of 40 to 50 lb. per acre, with enough water added to give good leaf coverage. Sinox General, containing one of the dinitro compounds plus an emulsifier, and used at 1 to 1½ q. or more plus 2 or more gals. stove or diesel oil per 100 gals. water, has given good results. Another effective mixture is Dow Contact Herbicide, used at the rate of 1½ to 2 or more gals. per 100 gals. water with additional oil if desired.

LARGE (E. C.), BLENKINSOP (A.), & LE RICHE (H. H.). **Potato leaf scorch.**—*J. Minist. Agric.*, liii, 5, pp. 211–216, 1 pl. (facing p. 209), 1946.

Almost all the potatoes, both early and late varieties, grown in Devon and Cornwall show a condition of the foliage due to potash deficiency and known to growers as 'rust' [*R.A.M.*, xxiii, pp. 39, 314], but which the authors prefer to term 'leaf scorch'. Brown markings become superimposed on the normal autumn yellowing of the leaves, though the crop is little affected. Sometimes, however, scorching appears on maincrop potatoes in July, about a fortnight after flowering, or as soon as the plants have made their maximum growth of haulm, and may become exceedingly severe by mid-August. The leaflets, often hard and bluish-green at first, turn yellow towards the tips, they are marked both on the yellow and the green parts by brown spots and patches between the veins, and the edges are scorched. Whole leaves dry up, the leaf stalks double over, and the main stems collapse. The condition is usually more severe in the centres of fields, is more prevalent on dry or sandy soils than on good loam with sufficient organic

matter, and tends to be more severe in semi-drought than when there is plenty of rain, though it is common in wet seasons. Early crops show more leaf scorch in mid-August than later ones. Arran Banner appears to be more affected than Majestic.

Leaf scorch tends to be most severe on soils of high or average pH and high or normal lime content with high phosphate, and on crops of average to moderately good growth. A top-dressing to these soils of extra muriate of potash hoed in before earthing-up strikingly reduced leaf scorch and gave an increase in yield of 0·6 to 6 tons per acre. Spectrographic analyses of leaves showed that as the potash declined the calcium and magnesium contents increased, and vice versa. At the time when leaf scorch occurs, the amount of potash in the leaves dwindles and that of calcium and magnesium rises. It may be that leaf scorch is due at least as much to a high lime as to a low potash content and that the amount of leaf scorch depends on the calcium plus magnesium to potash ratio in the leaves.

Ordinary Bordeaux mixture often delays the onset of the condition. As the primary cause of the trouble often seems to be excess nitrogen, phosphate, or lime, rather than deficient potash, it may sometimes be better policy to avoid such excesses than to correct them with extra potash.

SMALL (T.). **Further studies on the effect of disinfecting and bruising seed Potatoes on the incidence of dry rot (Fusarium caeruleum (Lib.) Sacc.).**—*Ann. appl. Biol.*, xxxiii, 2, pp. 211–219, 1946.

Continuing his studies on dry rot (*Fusarium caeruleum*) [*R.A.M.*, xxv, p. 315], of potato, the author describes experiments, carried out at Manchester University Field Station, Warburton, Cheshire, in which tubers of the susceptible varieties, Ninetyfold and Doon Star, taken from seed crops grown in contaminated soil, were disinfected in their boxes immediately before being clamped after lifting, with a 0·5 per cent. solution of aretan, in which they were immersed, respectively, for one and three minutes. In some of the tests, the natural contamination of the soil adhering to the tubers was reinforced by spraying each tuber with a spore suspension of the fungus.

Seed tubers which had not been deliberately bruised on lifting, whether disinfected or not, were practically sound after three and six months' storage in clamps, except in one instance. On being taken from the clamps, tubers not disinfected prior to clamping remained sound provided they were carefully handled and stored for a further period in seed boxes, but moderate or severe loss was sustained according to the severity of bruising on removal. Those disinfected before clamping showed similar results, except that they remained sound even when slightly bruised on removal from the clamps.

Severe infection by *F. caeruleum* developed during storage in tubers not dipped before clamping and deliberately bruised after lifting in July or on reclamping in October. Incidence of infection was not affected by the position of the tubers within the clamp. Losses were only slight in tubers not dipped on lifting and clamping in July, but dipped after light bruising on removal from the clamps in October; they were heavy on those severely bruised before dipping in October. Tubers not dipped on lifting and clamping but which, after three or six months' storage in clamps, were slightly bruised and then dipped and severely bruised again two days later, suffered considerable losses but far less than in those not dipped. Tubers dipped on lifting immediately before clamping, if slightly bruised before re-dipping on removal from the clamps in October, remained almost sound, but those severely bruised just before the second dipping showed a loss of 12 per cent. These results were obtained with tubers taken from healthy clamps. Apparently healthy tubers, even if taken carefully from clamps contaminated with *F. caeruleum*, became severely diseased when re-stored in seed boxes.

JODON (N. E.) & CHILTON (S. J. P.). **Some characters inherited independently of reaction to physiologic races of Cercospora oryzae in Rice.**—*J. Amer. Soc. Agron.*, xxxviii, 10, pp. 864–872, 1946.

In further studies at the Louisiana Agricultural Experiment Station on the inheritance of reaction to *Cercospora oryzae* in rice [*R.A.M.*, xxiii, p. 499], the authors found no linkage in the F_2 progeny of 17 crosses between this character and a number of morphological attributes, such as plant and straw colour, endosperm consistency, and hull and leaf pubescence.

KHANNA (K. L.) & RAMNATHAN (K. R.). **A note on the occurrence of smut in Saccharum munja Munj Grass.**—*Curr. Sci.*, xv, 9, pp. 253–254, 2 figs., 1946.

A clump of *Saccharum munja* from Biknathoree, in the Terrai foothills, transplanted and grown at the Sugar-cane Research Station, Pusa, Bihar, India, produced numerous arrows, all attacked by a smut which was identified by B. B. Mundkur as *Sphacelotheca schweinfurthiana* (Thüm.) Sacc. This is believed to be the first record of a species of *Sphacelotheca* on *Saccharum*, though a member of the related genus *Sorosporium* [*S. indicum*] was reported by Mundkur on *Saccharum munja* in 1942 [*R.A.M.*, xxi, p. 305]. The diseased arrows were stunted and blackish but did not form the characteristic 'whips' of sugar-cane smut (*Ustilago scitaminea*) [ibid., xxv, p. 577]. All the florets were involved, and each contained masses of blackish spores replacing their essential organs. The infected shoots were abnormally precocious, some of them arrowing as early as May instead of at the normal time in November, a tendency already described by Rafay and Padmandabhan in connexion with sugar-cane smut [ibid., xx, p. 596] and recently observed on Co. 513 by the senior author of the present paper.

MOESZ (G. v.). **Fungi Hungariae. III. Ascomycetes. Pars 1. IV. Basidiomycetes. Pars 1. Uredineae.**—*Ann. hist.-nat. Mus. hung.*, Pars bot., xxxi, pp. 1–61, 1939; xxxiii, pp. 127–200, 1940; xxxiv, pp. 72–158, 1941; xxxv, pp. 73–87, 1942. [Hungarian and German. Received September, 1946.]

These further instalments of the author's critical studies on the mycoflora of Hungary [cf. *R.A.M.*, xviii, p. 139] comprise annotations on some 120 Ascomycetes [cf. ibid., xiii, p. 127] and 400 Uredineae on over 300 and 777 hosts, respectively. Bibliographies are appended to both sections, the entries relating to the Ascomycetes numbering 62 and those concerning the Uredineae 94.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xx, 7–8, pp. 71M–73M, 1946.

BELGIUM. By a Decree dated 11th March, 1946, all elms showing evident infection by *Graphium* [*Ceratostomella*] *ulmi* must be reported by land-owners or their agents to the forest inspector of the province before 1st July of each year. The affected trees must be felled within a period established by the forest inspector. This Decree replaces that of 21st August, 1942.

By Decree of the same date, all poplars evidently attacked by 'poplar canker' [*R.A.M.*, xiv, p. 478] must be similarly reported and felled.

FRENCH MOROCCO. By a Decree dated 20th November, 1945, the Decree of 10th September, 1936 [cf. ibid., xvi, p. 144] relative to the sanitary policy governing the importation of vegetables is supplemented by an Article, according to which consignments of potatoes, tomatoes, or eggplants must be certified in the country of origin as free from *Synchytrium endobioticum*, and the potato viruses: spindle tuber, unmottled curly dwarf [? a strain of spindle tuber], witches' broom, Canada streak [potato aucuba mosaic: ibid., xix, p. 162], and calico [caused by a strain of lucerne mosaic virus].

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Joffily (J. M.). **Bacteriose das folhas da Mamoneira.** [Bacteriosis of Castor leaves.]—*Rodriguésia*, ix, 19, pp. 21–24, 2 pl., 1945. (Issued 1946.)

The foliar bacteriosis of castor (*Ricinus communis*) caused by *Bacterium ricinicola* [*R.A.M.*, xiii, p. 565] is recorded from Rio de Janeiro, Brazil. Inoculations on healthy castor plants gave positive results, and the pathogen was reisolated from the infected tissues.

Moesz (G. v.). **Pilze aus dem westlichen Gebiete Ungarns.** [Fungi from the western region of Hungary.]—*Arb. ung. biol. ForschInst.*, xiii, pp. 175–186, 1941. [Hungarian summary. Received 1946.]

An annotated list is given of 164 fungi of western Hungary, of which 95 are new records for the region.

Wickerham (L. J.). **A critical evaluation of the nitrogen assimilation tests commonly used in the classification of yeasts.**—*J. Bact.*, lii, 3, pp. 293–301, 2 figs., 1946.

The ability of yeasts to utilize ammonium sulphate, urea, asparagin, and peptone has served for the past 12 years as a criterion for their classification [*R.A.M.*, xiv, p. 192]. The author's studies at the Northern Regional Research Laboratory, Peoria, Illinois, have demonstrated that nine species, previously designated as incapable of assimilating the first three compounds, can do so on the addition to a modification of Lodder's medium of an adequate supply of pure vitamins. Urea proved to be toxic to nine out of ten species of *Candida* at 0·092 per cent., at which concentration only *C. flareri* continued to grow; all developed normally in the presence of 0·046 per cent.

Teixeira (A. R.). **Himenomicetos brasileiros. Hymeniales–Thelephoraceae.** [Brazilian Hymenomycetes. Hymeniales–Thelephoraceae.]—*Bragantia, S. Paulo*, v, 7, pp. 398–434, 16 pl., 1945.

Included in this annotated list of the Thelephoraceae of Brazil is *Stereum frustulosum* on *Astronium fraxinifolium.*

Viégas (A. P.). **Uns poucos fungos do Brasil.** [A few fungi of Brazil.]—*Bragantia, S. Paulo*, v, 9, pp. 561–582, 12 pl., 1945.

This critically annotated list comprises 13 Brazilian fungi, including *Leptosphaeria agaves* Syd. & Butl. on *Agave* sp. and *Uromyces phaseoli longepedunculati* n.f. on *Phaseolus longepedunculatus.* The uredospores of the new form of the bean rust are nearly smooth, with pores on or near the equator, and the pedicels of the smooth-walled teleutospores are longer than the spores themselves.

Singer (R.). **The Boletineae of Florida with notes on extralimital species. IV. The lamellate families (Gomphidiaceae, Paxillaceae, and Jugasporaceae).**—*Farlowia*, ii, 4, pp. 527–567, 1 pl., 1946.

The author presents his fourth contribution, the third of which is in the press, to the study of the Boletineae of Florida, listing species with critical annotations,

subspecies, extralimital species, and species excludendae of the families Gomphidiaceae, Paxillaceae, and Jugasporaceae, and giving keys to the genera and species.

Stevenson (J. A.). **A nomenclatorial discussion of Ustilago striiformis.**—*Plant Dis. Reptr*, xxx, 2, pp. 53–59, 1946. [Mimeographed.]

In recent years some mycologists have used the binomial *Ustilago linearis* (Dozy & Molk.) Cif. instead of *U. striiformis* (West.) Niessl for the fungus causing the common stripe smut of American grasses. The usage apparently originated with Ciferri (*Flora Italica Cryptogama*, fasc. 17, 339, 1938), who based the new combination on '*Caeoma lineare* Dozy & Molk. *Tijdschr. Natuurgesch. Physiol.*, xi, p. 407, 1844', the authors of which properly attributed it to Link. The fungus described by Link (syn. *Uredo linearis* Pers.) is generally considered to be a rust and from the description could not possibly be the leaf smut under discussion.

The specific epithet *striiformis* for the stripe smut fungus was set up by Westendorp (*Bull. Acad. Belg. Cl. Sci.*, xviii, p. 406, 1852), who stated that *U. striiformis* occurred on the young shoots of *Holcus lanatus* and *Anthoxanthum odoratum*. Niessl (*Hedwigia*, xv, p. 1, 1876) transferred the species to *Ustilago*. Earlier, however, Berkeley and Broome (*Ann. Mag. nat. Hist.*, Ser. 2, v, p. 463, 1850) had described as a new species *U. salvei*, forming elongated, parallel, black sori on the upper surface of leaves of *Dactylis glomerata*. De Toni (Sacc., *Syll. Fung.*, vii, p. 485, 1885) considered this a synonym of *Tilletia striiformis* and Liro (*Die Ustilagineen Finnlands*, i, pp. 75–76, 1922) used the name for a smut on *Dactylis glomerata* which he considered distinct from *U. striiformis* on *Holcus* and other grasses. He also cited a dozen other workers who used the name this way. Examination of Berkeley and Broome's type specimen at Kew indicated that the host is apparently *H. lanatus* and that the fungus agrees with *U. striiformis*. It would, however, be most unfortunate to substitute the relatively little-known and generally misapplied epithet *salvei* for the widely used and descriptive *striiformis*, and the writer prefers to consider the former a *nomen ambiguum* under Article 62 of the Rules.

Traversi (Blanca A.). **Inclusiones celulares de Nicotiana virus 1 en Nicotiana tabacum.** [Cellular inclusions of *Nicotiana* virus 1 in *Nicotiana tabacum*.]—*An. Soc. cien. Argent.*, cxlii, 3, pp. 97–103, 3 pl., 1946. [English summary.]

The cells of tobacco plants artificially infected by the tobacco-mosaic virus were found, on examination at the Institute of Plant Hygiene of the Ministry of Agriculture, Buenos Aires, to contain crystalline and amorphous or viroplast inclusions, appearing about ten days after inoculation and vanishing after 20 to 22 days. Trypan blue and phloxine [*R.A.M.*, xxi, p. 90] proved excellent for the selective staining of the virus, imparting a pink or purple coloration to the viroplasts and bringing the crystals into relief.

Pascalet (P.). **Étude d'une maladie à virus sur Tabac, variété Deli-Sumatra, à la plantation de Batchinga (région Nyong et Sanaga).** [A study on a virus disease of Tobacco of the Deli-Sumatra variety in the Batchinga plantation (region of Nyong and Sanaga).]—*Rev. Bot. appl.*, xxi, 235–236, pp. 110–122, 1941. [Received October, 1946.]

Cape tobacco of the Deli-Sumatra variety growing at Batchinga, in the Cameroons, showed sporadic disease in 1935; a year later more than twice as many plants were affected, and in 1937 heavy losses were sustained, the disease also being present for the first time in the nurseries. Observations by the writer showed that the condition was apparently identical with the virus diseases known in Sumatra and Java as krulziekte ('frisure' or 'leaf curl') and kroepoekziekten

('feuilles gaufrées' or 'crinkle') [? tobacco leaf-curl virus: *R.A.M.*, xi, p. 478; xxi, p. 167], while the usual type of mosaic was noted on self-sown seedlings. The disease began on nursery seedlings at the three-leaf stage as mosaic and then developed into the more serious forms of leaf-curl crinkle. When the first picking was made, 40 to 45 days after planting, some plants already showed the three forms of the disease, the proportion showing leaf curl becoming progressively higher and the symptoms more marked as the plants aged. The percentages of affected plants at the picking of the lowest, middle, and top leaves were, respectively, 5, 20, and up to 100. At the final picking the symptoms [which are fully described] had reached their fullest development. The affected plants were much more susceptible than healthy ones to infection by *Cercospora* [*nicotianae*].

Locally, the principal vector of leaf curl and crinkle would appear to be the white fly, *Bemisia* [*gossypiperda* var.] *mosaicivecta*; *Macrosiphum tabaci* and *Aphis* [*Myzus*] *persicae*, which transmit mosaic, are less important. Other insects also may be implicated.

As plants only ten days old show the condition the author considers that the disease may, possibly, be seed-borne [cf. loc. cit. and ibid., xxiii, p. 215]; new seed must be imported, and a selection site made at least 10 km. distant from the plantation. Topping should be carried out, and all topped heads and old stalks should be burnt. If the disease persists, tobacco should be followed by *Mimosa invisa* in a three-year rotation. Active steps must be taken to suppress insect infestation. To render the virus inactive the soil should be adjusted to pH 7·8 or 7·9 by liming three months before planting, heated to 80° to 90° C. to a depth of 10 cm., and deeply dug over. In the nurseries powdered wood charcoal, and formalin, phenic acid, or lysol in weak doses are recommended. Cucumber extracts have a depressing action on viruses, and cucumbers should be grown in affected areas, or the nurseries treated with dilutions of such extracts.

FOSTER (R. E.). **The first symptom of Tomato wilt: clearing of the ultimate veinlets in the leaf.**—*Phytopathology*, xxxvi, 9, pp. 691–694, 1 fig., 1946.

An even earlier symptom of tomato wilt (*Fusarium oxysporum* f. *lycopersici*) [*F. bulbigenum* var. *lycopersici*] than the epinasty described by Wellman [*R.A.M.*, xx, p. 386] is a clearing of the ultimate veinlets of the leaflets, inducing a 'netted' appearance which is perceptible only under transmitted light. In an intensive study at the Wisconsin Agricultural Experiment Station of 50 young plants inoculated with a virulent strain of the pathogen and held under optimum moisture and temperature (28° C.) conditions for wilt development, veinlet-clearing frequently appeared 24 hours after inoculation. The terminal leaflet of the third leaf was usually the first to lose the green colour, followed in another 12 hours by the second and fourth leaves and subsequently (within 48 hours of infection) by all the rest. The pallor soon progressed along all the veinlets and extended into the 'vein-islets', which looked darker green just before clearing. With the spread of the clearing from the veinlets, yellow areas developed in the leaf and later coalesced, giving rise to the 'yellow-leaf' symptom of the disease. Epinasty did not develop in any of the plants until 72 hours after inoculation, and in most it was first apparent after 84. Veinlet-clearing seems to be exclusively associated with the effects of *F. bulbigenum* var. *lycopersici* on its host, being absent from uninoculated plants kept under comparable conditions. The fungus could not be isolated from the affected leaf areas 36 hours after inoculation, and attempts to infect healthy tomato and tobacco foliage with the expressed juice of diseased leaflets also gave negative results.

Veinlet-clearing has been observed in the Bonny Best, Marglobe, Master Marglobe, and Rutgers varieties under diverse environmental conditions, but not in the highly resistant Red Currant tomato (*Lycopersicon pimpinellifolium*) or in

hybrids with a similar reaction. The early symptom of wilt was induced by three strains of the fungus, namely, R5–6, a virulent, raised isolate, A15–8, mild and adpressed, both supplied by F. L. Wellman [ibid., xx, p. 91], and one of intermediate pathogenicity from J. B. Kendrick, California. Fisher's method of inoculation [ibid., xv, p. 406] was used in a number of trials, in which Bonny Best plants were grown in soil to the five- to six-leaf stage, dug, the roots cut off under water, and the stems placed in filter-sterilized Richard's solution staled by the growth for varying periods of virulent strains of the pathogen. Veinlet-clearing developed only in plants placed in the medium from an agitated 28-hour culture.

Precocious symptoms of tomato wilt have been of considerable value in greenhouse and laboratory studies and are of interest in connexion with a somewhat unfamiliar phase of pathogenesis. The appearance of a pathological symptom in the aerial system of a plant only 24 hours after root inoculation indicates that a toxin is secreted at or very shortly after the moment of penetration, and certainly before the establishment of the organism in the host tissues. It is not yet clear whether the veinlet-clearing toxin is produced by the fungus or by the plant in reaction to invasion, but the former explanation is regarded as the more plausible of the two.

VITORIA (E. R.). **La 'estria negra' del Tomate.** [The 'black streak' of Tomato.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, ii, 14, 20 pp., 9 figs., 1946. [English summary.]

Experimental evidence is adduced in proof of the implication of two viruses, namely, those of tobacco mosaic and potato virus X [*R.A.M.*, xxii, p. 82], in the etiology of the tomato disease characterized in Argentina by the symptoms of streak, which has commonly been confused with the so-called 'pesta nigra' [black pest], apparently a manifestation of spotted wilt [ibid., xxi, p. 481]. To obviate further ambiguity the author proposes to designate as 'estria negra' [black streak] the disease of mixed origin, while the name of 'black pest' should be reserved for the Argentine form of spotted wilt. Black streak symptoms of tomato are fully described and the results of transmission experiments with the mixed virus given.

The negative results of inoculation experiments on cowpea are considered to exclude the tomato spotted-wilt virus as an agent of black streak.

The separation of the two viruses of black streak was effected by ten minutes' exposure of the juice from diseased tomato plants to a temperature of 80° C., which inactivates potato virus X but not the heat-resistant tobacco mosaic virus. All the mechanical transmission experiments with the latter on tomato, tobacco, and *N. glutinosa* were successful.

The potato virus X component was extracted by infecting *N. glutinosa* plants, in which the tobacco mosaic virus does not become established. This component was inoculated with uniformly positive results into tomato, tobacco, chilli, and *N. glutinosa*. The filterability, thermal inactivation points, and dilution limits of the two components support the hypothesis that one is tobacco mosaic virus and the other potato virus X.

STODDARD (E. M.). **Soil applications of oxyquinolin benzoate for the control of foliage wilting in Elms caused by Graphium ulmi.**—Abs. in *Phytopathology*, xxxvi, 8, p. 682, 1946.

Soil applications (10 gals. per tree in a single dose or five of 2 gals. on alternate days) of aqueous solutions of oxyquinolin benzoate at 0·1, 0·05, 0·025, and 0·0125 per cent. were made to groups of ten elm trees, 1·5 in. diameter at breast height, either 10 days before or 10 days after inoculation with *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xxii, p. 504].

At 0·1 per cent. only 27·5 per cent. of the trees wilted as compared with 73·4 per cent. of the controls, the amount of wilting per tree also being less at this concentration than at any other, irrespective of mode or time of treatment. Plots receiving the single dose, however, at all concentrations showed more wilted trees but less wilting per tree than those treated with multiple doses. Treatment before or after inoculation made no difference. The isolation of the pathogen from an approximately equal number of trees from all plots, whether treated or not, suggests that oxyquinolin benzoate acted as an antidote to the fungus toxin causing the wilting and was not fungicidal in action.

WOODRUFF (J. B.). **Chestnut blight in Italy.**—*Trees*, vi, 4, pp. 8–9, 16, 1 fig., 1 map, 1946.

Grave concern is stated to have been caused in Italy by the fact that chestnut blight (*Endothia parasitica*) [cf. *R.A.M.*, xxii, p. 53] has now become established there and is steadily spreading. The first infection was observed in 1938 at Busalla, some 20 miles north of Genoa. Since then the disease has been found throughout the Province of Genoa and in the Region of Liguria, and two further infections have been discovered, one at Nola, near Naples, and the other at Tarcento, north of Udine, in north-eastern Italy. The attack at Busalla in 1938 affected approximately 200 trees over an area of about three acres, and, when found, the disease appeared to have been present for five to eight years. In 1946 only a few trees remained, and all were dead except for sprouts on the lower part of the trunks. The sprouts from the stumps of trees removed were severely cankered when only two or three years old. By 1942 one-half of the 190,000 acres of chestnuts in the Province of Genoa had become infected, and 'spot' infections had been noted in the adjoining Province of La Spezia and in the Region of Liguria. As a rule, trees 12 to 16 in. in diameter were dead or dying eight to ten years after infection had occurred.

Soon after the blight had been detected an effort to control it was made in Liguria. Landowners were ordered to cut out and destroy all infected parts of trees, the transport of wood of any species from one village to another was permitted only after official inspection, and the removal of any chestnut wood from the area of infection was prohibited. With the outbreak of war, however, it became very difficult to enforce these regulations. At present it is hoped that some degree of control may result from the development of resistant strains.

WALTER (J. M.). **Canker stain of Planetrees.**—*Circ. U.S. Dep. Agric.* 742, 12 pp., 6 figs., 1946.

The available information on the canker stain of London plane (*Platanus acerifolia*) in the United States caused by *Endoconidiophora* sp. [*R.A.M.*, xxiv, p. 39] is summarized. The destructiveness of the disease may be gauged by the records of losses at Gloucester, New Jersey, one of the oldest centres of infection, where the mortality rate was 5·6 per cent. a year between 1940 and 1943, at the end of which 60 per cent. of the trees originally planted in the area were a total loss and a further 12 per cent. were infected. Of the 153,000 planes planted in Philadelphia, 10,000 are estimated to have succumbed to the disease; in 1940 the cost of removing a dead tree and replacing it by a young one was $35. Control measures should include pruning between 15th February and 1st December (in the latitudes of Philadelphia and New York); pruning tools should be disinfected with denatured alcohol before use on healthy trees, and climbing ropes can be decontaminated by three hours' exposure to formaldehyde vapour. The canker-stain fungus survives for lengthy periods in asphalt paint wound dressings, which should be replaced by a gilsonite varnish with the addition of 0·2 per cent. phenylmercuric nitrate.

MINKEVICIUS (A.). **Beitrag zur Verbreitung, wirtschaftlichen Bedeutung und zur Frage der Überwinterung von Cronartium ribicola Dietrich in Litauen.** [Contribution to the distribution and economic importance and to the problem of the overwintering of *Cronartium ribicola* Dietrich in Lithuania.]—*Phytopath. Z.*, xiv, 5, pp. 604–612, 1944. [Received August, 1946.]

In a preliminary study from 1935 to 1938 ten black currant bushes planted in a white pine (*Pinus strobus*) stand attacked by *Cronartium ribicola* [cf. *R.A.M.*, xvii, p. 281] contracted 71 to 100 per cent. infection in each of the four years. In similar plantings at a distance of 1 km. from the plantation, two bushes were rust-free in 1935 and nine in 1938; 1 to 30 per cent. infection developed on 4, 1, 5, and 1 in 1935, 1936, 1937, and 1938, respectively, 31 to 70 per cent. on 3, 1, and 1 in the first three years, and 71 to 100 per cent. on 1, 8, and 4, also excluding 1938. Elsewhere in the neighbourhood the numbers of bushes showing 1 to 30 per cent. infection in 1936, 1937, and 1938 were 1, 10, and 11, respectively, 31 to 70 per cent., 2, 6, and 6, and 71 to 100 per cent., 13, 2, and 4. Red currants, ordinarily very much less susceptible to the rust than the black varieties, also contracted the disease in a relatively mild form in the white pine planting, as also did the normally highly resistant gooseberry; on individual bushes the number of rusted leaves in the late summer ranged from 2 to 70 per cent.

Under Lithuanian conditions the perennation of the rust is effected solely by means of the teleutospores. The uredospores are responsible for its dissemination. Experiments in 1937 and 1938 showed the incubation period of these spores to be 10 to 12 days in the laboratory and 12 to 14 in the open, so that, even under weather conditions unfavourable for the pathogen, several generations can be produced in the course of a season. The only means of combating the currant rust, therefore, seems to lie in the confinement of white pines (pending the development of resistant forms) to experimental areas, more especially as a large proportion of the trees succumb to the disease. In the Kauen Botanical Garden, for instance, of 71 white pines planted in 1937, 17 had been killed by *C. ribicola* by 1944 and 37 were more or less severely infected.

ELLIS (D. E.). **Anthracnose of dwarf Mistletoe caused by a new species of Septogloeum.**—*J. Elisha Mitchell sci. Soc.*, lxii, 1, pp. 25–50, 3 pl., 1 fig., 5 graphs, 1 map, 1946.

In North America the dwarf mistletoes (*Arceuthobium* spp.) are highly important parasites of conifers. They cause widespread damage in western forests, coming next in importance to heart rots in point of losses produced, and they appear likely, unless more attention is paid to their control, to become much more injurious than fungi in cut-over forest areas. The best means of control at present known is to prune out infected branches repeatedly and remove severely affected trees from the stand, but this method is both arduous and expensive.

It has now, however, been found that *Arceuthobium* is attacked by a hitherto undescribed imperfect fungus which causes anthracnose and is responsible for the premature death of numerous shoots. The disease has been observed in six western states and it occurs naturally on seven of the eight forms of *A. campylopodum* and on *A. douglasii*. It attacks the stems primarily and occasionally the fruits, producing minute, yellowish-white spots which converge and break through the cuticularized epidermal layer, exposing large, white spore masses; pistillate plants are more often affected than staminate ones.

The fungus, which is named *Septogloeum gillii* n.sp., is characterized by the convergent character of the fruiting layer and hyaline, granular, cylindrical to fusiform, straight or slightly curved, continuous to triseptate conidia measuring

6·2 to 41 by 2·6 to 5·1μ, borne singly but in succession at the tips of the conidiophores, and accumulating in white, slimy masses, chalky and hard when dry. The simple or branched, continuous or septate, hyaline conidiophores measure 10 to 51 by 1·4 to 2·2μ.

In culture it grew well but very slowly on most of the usual agar media. It was isolated from five different host sources, and was differentiated into four strains which differed in rates of growth, colour (from a maize-yellow margin and Sanford's brown centre to a light mineral-grey margin and pale salmon or white centre), and type of growth (compact-velvety to radiating or with more aerial hyphae, and compact, woolly surface). The minimum, optimum, and maximum temperatures for growth in culture were, respectively, 1°, 17·5°, and slightly over 22·5° C., approximately.

Inoculation tests demonstrated that the fungus readily infects the host without the aid of wounds. It invades all the internal stem tissues except the vascular elements and develops a profuse intercellular mycelium. In some areas the disease appears greatly to reduce the reproduction and local spread of the host, but further work will be required to ascertain whether it can be used for biological control in new localities.

BIER (J. E.) & FOSTER (R. E.). **The relation of research in forest pathology to the preparation of forest inventories. 1. Suggested aids for cruising overmature stands of Sitka Spruce on the Queen Charlotte Islands.**—Reprinted from *B. C. Lumberm., April, 1946*, 4 pp., 3 graphs, 1 map, 1946.

In this first paper of a series dealing with forest disease prevention and control the authors state that an accurate inventory of a forest unit is the primary requirement for the management plan of the area. Inventories of forests which, like those in British Columbia, consist mostly of over-mature timber, are dependent in part upon a knowledge of the incidence, amount, and external indications of decay. During the past four years investigations into the forms of decay affecting Sitka spruce [*Picea sitchensis*] on the Queen Charlotte Islands showed that 31 different species of fungi can attack these trees and that, except in the case of conk rot (*Fomes pini*) [*R.A.M.*, xxv, p. 531] there are no reliable external indications of the different forms of decay. It is, however, possible in a given region to determine the amount of decay which occurs in a sufficient number of felled and bucked trees of all ages to serve as an example of the condition of the timber. The data presented are based on a detailed stem-analysis of 1,977 trees and are applicable only to Sitka spruce in this locality.

Fungal infection was not common in trees under 200 years of age. The percentage of diseased trees increased steadily after that with increasing age, and at 700 years all the trees were infected at some point in their merchantable length. Of the trees examined, 47 per cent. showed decay. The average decay volume was under 1 per cent. of the gross merchantable volume in trees up to 200 years old. After this, decay increased in the subsequent age classes, until in trees 750 years old 26·6 per cent. of the gross merchantable volume was destroyed. It was also found that decay was unimportant in trees 20 to 25 in. in diameter, but increased steadily until 24 per cent. of the gross merchantable volume was lost in the 100-in. diameter class.

In estimating the amount of decay likely to be present in the stands of these trees it should be possible to place the trees in broad age classes on a basis of their size and appearance; the factor for decay would then vary with the age classes in the stands. This method should give a more reliable estimate of current and future losses from decay than do methods which disregard the age factor. In any one region an adequate sample should be felled and analysed for decay, and the results applied to the remaining, uncut timber.

SCOTT (M. H.). **The use of chemically treated wooden poles for telephone and power transmission lines in South Africa.**—*J. S. Afr. For. Ass., 1946*, 13, pp. 21–34, 12 figs., 1946.

Experimental work on timber preservation has been in progress in South Africa since 1922, when a preserving plant was opened by the Forest Department, consisting of a steam-heated open tank, a high-pressure cylinder, and a small chemical laboratory. The original installation has been expanded from time to time to meet the requirements of commercial practice. The first telephone poles to be treated in the plant were put into service in 1924 and transmission poles in 1926, since when records have been kept of the condition of a very large number (pine and *Eucalyptus*) treated with a variety of preservatives and set up all over the Union under the most adverse conditions. The preparations tested fall into two main classes, namely, creosotes and other oily substances, and water-soluble salts, e.g., zinc chloride and arsenic, about 15 of the former and 50 of the latter category having been used. More recently pentachlorophenol and copper naphthenate preservatives have been tested, and both promise to assume increasing importance in wooden telephone and transmission pole line operations.

Details are given of the three common methods of creosote treatment in use at the plant, i.e., the open-tank and the full- and empty-cell pressure processes. A table is given showing the average life of treated and untreated poles, from which it appears that in South Africa creosote and metallic salts extend the duration of service from between two and seven to 20 to 30 and from 6 to 15 years, respectively.

From the outbreak of war up to 1944, the average annual supply of transmission and telephone poles by the State has been rather more than 7,000 and 26,000, respectively. At the time of writing an acute shortage of creosote in the Union has restricted the provision of poles to the most urgent undertakings.

SCOTT (M. H.). **Appropriate use of wood preservatives.**—*Fmg S. Afr.*, xxi, 244, pp. 479–482, 1 fig., 1946.

The classification and general properties are given of timber preservatives, based on 25 years' experimental work on over 100 different preparations tested under varied conditions of exposure to wood-destroying agencies. The main classes cited are creosotes, aqueous solutions, and organic solvents, both volatile and non-volatile [see preceding abstract]. The methods of application are briefly reviewed.

BJÖRKMAN (E.). **Om lagringsröta i massavedgårdar och dess förbyggande.** [On storage rot in pulpwood yards and its prevention.]—*Medd. SkogsforskInst., Stockh.*, xxxv, 1, 174 pp., 47 figs., 1 diag., 26 graphs, 1946. [English summary.]

Stereum sanguinolentum was the most prevalent agent of the serious decay developing in pine and spruce pulpwood in the north of Sweden during the war period of 1940 to 1945, when work in the yards was virtually at a standstill and large quantities of material had to be stored in a limited space. It developed during the first summer after felling, while other early invaders were *Polyporus* [*Polystictus*] *abietinus* and its variant *Irpex fuscoviolaceus* [*R.A.M.*, xxv, p. 525] and *Corticium evolvens* [ibid., xvi, p. 7]; the last-named was particularly common in birch wood, which was further disorganized by *S. purpureum*, *S. hirsutum*, and *Polyporus zonatus*. More destructive than these early-rot fungi, which are primarily lignin-consumers, are the cellulose-decomposing species [ibid., vi, p. 68] developing at a later stage in inadequately dried coniferous wood, including *Poria vaporaria* [ibid., xxiv, p. 300], *Trametes serialis*, *T.* [*Lenzites*] *trabea*, and *L. sepiaria*.

Damage from wood-rotting fungi was always more extensive in wood with the bark left intact or only partially removed than in completely decorticated material,

and specially favourable conditions were provided by the humid atmosphere prevailing at the bottom of the piles; however, in very closely packed piles the excessively high moisture content of the lower layers precluded the development of the organisms, which consequently migrated to the middle of the stack. The microclimate in pulpwood piles varies considerably with the height and spacing of the piles and also with the degree of drying. Generally speaking, the humidity inside and between the piles greatly exceeds that of the open air, reaching 90 to 100 per cent. in the former location during the summer compared with 40 per cent. in the latter. The temperature, on the other hand, is considerably lower in the interior of the stacks than outside them; for instance, it did not rise above 10° C. between two piles in July, remaining constant day and night irrespective of external fluctuations.

The importance of storage rots in the manufacture of sulphite and sulphate pulps was investigated in about 100 boilings of pine and spruce wood stored for varying periods and attacked by different fungi. *S. sanguinolentum* was shown to reduce the yield by 1 to 3, 10, and 15 to 20 per cent. in one, two, and three years, respectively, of defective storage, while the above-mentioned cellulose-destroying organisms were responsible for still heavier losses, *L. trabea*, *T. serialis*, and *Polystictus abietinus*, for example, causing losses of 21, 16, and 28 per cent., respectively, the two first-named within two years and the third in four. Fungal decay also diminishes the strength of the pulp, especially sulphite, *S. sanguinolentum* causing a decrease of 5 to 10 per cent. in two years, while the cellulose-destroyers are a source of correspondingly greater damage. The darkening of the pulp consequent on storage rot, even after only a year of infection by *S. sanguinolentum*, may entail de-grading from the first to the second class. Blue stain, due mostly to *Pullularia pullulans* [ibid., xxv, p. 241], results in a greyish pulp, but this defect appears to be significant only in the case of sulphite.

In laboratory experiments under controlled conditions the wood-rotting fungi usually developed most rapidly in a moisture-saturated atmosphere [cf. ibid., xviii, p. 360]. A decrease in the relative humidity to 95 per cent. considerably impaired the activity of the fungi, at 90 per cent. (fibre-saturation point), corresponding to 24 per cent. water content of the wood, their growth was largely inhibited, and at 85 per cent. relative humidity (20 per cent. water content), they were unable to cause any damage. Similarly, at a very high water content, approaching saturation of the wood, there was a marked falling off in fungal activity, though some of the organisms could develop fairly well in the portion of the wood above water-level, e.g., *Coniophora puteana*, *Merulius lacrymans*, *Poria vaporaria*, *T. serialis*, *L. trabea*, *Polyporus ferrugineo-fuscus*, and *Lentinus lepideus*, while several proved capable of continued growth in infected wood even under immersion, including *P. ferrugineo-fuscus*, *Poria vaporaria*, and *L. lepideus*. None of the fungi, however, could invade sound water-saturated wood above or below water-level: a saturation degree of 70 per cent., corresponding to a water content of 120 per cent., generally sufficed to exclude them. The optimum degree of saturation for most of the species under investigation lay between 20 and 50 per cent., representing 35 to 85 per cent. water content of pine wood. The early-rot fungi throve at the lower values of the humidity range, while most of the later invaders were more active at the higher ones. The production of fruit bodies is often stimulated by a comparatively dry atmosphere (95 to 98 per cent. relative humidity), and thus the appearance of these organs and surface mycelium is not necessarily an index of extensive disorganization of the wood. With a few exceptions, however, such as *C. evolvens*, fruit body formation does connote an advanced stage of decay.

The optimum temperature for most of the fungi was about 25°, though their requirements varied to some extent, *S. sanguinolentum* and *M. lacrymans* developing best at 20° and *Lenzites sepiaria* and *L. trabea* at 30°. The growth and

wood-destroying activities of the late-rot group were inhibited at 5° [cf. ibid., xix, p. 56], but the early agents of decay made some progress at the low temperature: this ability to withstand cold promotes vegetative development and assists in the rapid spread of the organisms.

Practical recommendations for the control of storage rot, based on the foregoing observations, include the following. In upper Norrland it is safe to store pulpwood in calm water over one summer and autumn without serious risk of decay, but under the warmer conditions prevailing farther south this practice is inadvisable. For land storage the wood should be completely decorticated and stacked in well-ventilated piles, resting on specially constructed foundations of dry pine logs and thick fuel wood above ground-level to ensure drainage and the replacement of the cold, heavy air in the lower layers by dry air. High piles of floated timber should be separated by a space of at least 3 m. One-row piles, i.e., of the breadth of one log, are preferable to those of two rows with overlapping ends. Wood yards should be situated on hard, sloping ground and the piles laid in the direction of the prevailing winds, the intervening spaces being cleared of fallen logs and superfluous vegetation to reduce the moisture content of the air. The best drying season, April to June, should be utilized for the lower parts of the piles (a height of 5 to 7 m.), the upper layers being added in the late summer to dry during the following spring; alternatively the piles may be built up to half their height in the autumn and completed immediately after drying in the spring, when they will be ready for manufacture the next autumn.

LÖHNIS (MARIE P.). **Weefselwoekering door voedselstoring.** [Tissue proliferation from nutritional disturbance.]—*Tijdschr. PlZiekt.*, xlvii, 4, pp. 149–153, 1941. [Received November, 1946.]

In the course of studies on the reaction of swedes to boron deficiency in water cultures the author examined roots measuring 8 cm. across showing, besides a well-marked discoloration of the medulla, a distinct brown ring representing the rudiments of the cambial layer, which are macroscopically invisible in healthy material. Under the microscope the affected tissues are seen to be abnormally expanded and composed of very irregularly shaped cells; there is no sign of longitudinal extension. The differentiation of the meristematic cells into phloem and xylem is inhibited and replaced by a tissue of cells of which the shape seems to be determined by external pressure. A comparable picture is presented by the cork cambium of field swedes suffering from 'brown heart' in Holland [*R.A.M.*, xvii, p. 432; xviii, p. 153; xxii, p. 320].

The mechanism of the chemical processes underlying the phenomenon, which appears to be common to all plants liable to 'brown heart', is briefly discussed.

NEWTON (W.) & BOSHER (J. E.). **The longevity of Phoma betae in garden Beet.**—*Sci. Agric.*, xxvi, 7, pp. 305–306, 1946.

As part of an investigation undertaken with a view to preventing the introduction of seed-borne plant diseases into recently established seed-production areas in British Columbia, an inquiry into the viability of *Phoma betae* in seed of the Detroit Dark Red variety of garden beet was made. In 1940 B.C. Certified seed from the North Okanagan district of the Province showed a high percentage of *P. betae* infection. Each year from 1940 to 1945, one or more samples of 100 clusters were sown, equally spaced, in flats of autoclaved soil. The results showed a decrease in seedling mortality due to the pathogen with the increasing age of the seed, so that by 1945 only 2 per cent. loss amongst 158 seedlings was recorded, as against 33 amongst 121 in 1940, cluster germination being 80 per cent. in the latter year and 94 in 1945. At the same time, *P. betae* infection is rarely of sufficient economic importance to necessitate a five-year seed-storage period as a control

measure. The slight increase in germination shown after five years' storage may be important, but the factors which may affect germination are so many that the increase is not inferred to be due to the decline in the amount of fungal infection.

HARE (W. W.) & WALKER (J. C.). **Ascochyta diseases of canning Pea.**—*Res. Bull. Wis. agric. Exp. Sta.* 150, 31 pp., 7 figs., 1 graph, 1944.

Of the three *Ascochyta* diseases of pea, *A. pinodella*, *A. pisi*, and *Mycosphaerella pinodes*, the last-named is by far the most important under Wisconsin conditions [*R.A.M.*, xxii, p. 285; xxvi, p. 1]. It is the most frequently encountered and exhibits greater virulence than the others. Full descriptions of the life-history of *M. pinodes* and the blight it causes on the pea plant are given, with comparative accounts of the other organisms. *M. pinodes* was shown to overwinter on the pea straw, producing pycnidia in the middle of May and mature perithecia in early June. Both types of spore are disseminated only in moist weather but only the ascospores are wind-dispersed, and they may travel distances up to ¼ mile.

M. pinodes was found to be homothallic and to have an optimum temperature for growth between 20° and 28° C. Light exerted a stimulating effect on pycnidial production which was best secured at 16° on potato dextrose agar. Differences in cultural characters of the three species, their rate of growth, and rate of spore germination, were recorded. Ascospores of *M. pinodes*, produced on potato-dextrose agar and diseased leaves, averaged 7·9 by 17·2μ, while the pycnospores averaged 4·5 by 12·3μ, as against 3·7 by 8·0μ for *A. pinodella*, and 4·2 by 13·9μ for *A. pisi*. All three species caused a foot-rot presenting identical symptoms, the degree of virulence being in the descending order *A. pinodella*, *M. pinodes*, and *A. pisi*. On the aerial parts of the host *M. pinodes* and *A. pinodella* could not be differentiated macroscopically; all three species penetrate the host directly, rather than through the stomata. In greenhouse inoculations, the incubation period for *M. pinodes* and *A. pinodella* was from two to three and for *A. pisi* four to five days. In experiments with Wisconsin Perfection, Profusion, and Prince of Wales peas it was found that plants of the same variety may exhibit different degrees of tolerance to each of the three species, quite small plants being more tolerant under greenhouse conditions than larger ones. Slight differences in susceptibility to *M. pinodes* and *A. pisi* were noted in the greenhouse investigations, but none to the former in the field. Although early varieties were severely attacked by *M. pinodes* when late ones appeared quite tolerant, the symptoms of the latter group gradually increased in severity, and when all varieties were compared at their respective canning stages they were equally diseased. Since no varieties showing practical tolerance of *Ascochyta* diseases have been found, the best methods of control appear to lie in the use of disease-free seed, rotation, sanitation, and the separation of plantings of different maturity dates.

KOOPMAN (C.). **De bestrijding der vetvlekkenziekte.** [The control of the grease spot disease.]—*Tijdschr. PlZiekt.*, l, 3, pp. 62–68, 1944. [Received November, 1946.]

After a brief discussion of the difficulties of combating the bean (*Phaseolus vulgaris*) grease spot disease (*Pseudomonas medicaginis* var. *phaseolicola*) in Holland [*R.A.M.*, xxv, p. 90] by the cultivation of resistant varieties or seed selection, the writer reports promising results from several applications to the growing crop of 0·5 or 1 per cent. Bordeaux mixture, as recommended by Hähne in Germany [ibid., xxi, p. 512], preceded by the elimination of any sickly plants shortly after emergence. For breeding purposes, necessitating absolute purity of the seed, selection must still be practised, but the work is too laborious and time-consuming for large-scale operations. The grease spots are more easily discernible on the pods

than on the seed. Varieties susceptible to grease spot should be sown relatively late, i.e., not before 10th May for marketing and about the 15th for seed.

HEDGES (FLORENCE). **Association of Xanthomonas phaseoli and the common Bean-mosaic virus, Marmor phaseoli. II. Dissociation studies of X. phaseoli.**—*Phytopathology*, xxxvi, 8, pp. 589–612, 6 figs., 1946.

These studies of *Xanthomonas phaseoli* were undertaken to discover whether any changes in the bacterium had occurred during its two years' association with bean-mosaic virus *in vivo* [*R.A.M.*, xxiv, p. 47], which might explain its decrease in virulence and failure to maintain continuously its 'typical' form in the host tissues; and to determine whether a filterable form of *X. phaseoli*, capable of producing mosaic, existed.

Using Quirk's technique and special media [ibid., xi, p. 226, and *J. Bact.*, xliv, p. 148, 1942], dissociated cultures of a normal, virulent, S [smooth] yellow strain having no association with mosaic virus, and the 'typical' virulent, S yellow strain $P(M+P)^{34}$ were found to exhibit striking differences. This latter strain had been associated continuously for two years *in vivo* with bean-mosaic virus, and was isolated from the 34th serial passage of infected juice from bean plant to bean plant, that is, shortly before the disappearance of all bacterial symptoms from the inoculated plants which took place during the 36th serial passage, and before the sudden outbreak of ultra-severe mosaic in the 38th [loc. cit.].

The strain $P(M+P)^{34}$ dissociated into mildly infectious, opaque-white R to S (varying from rough to smooth) and non-pathogenic, S pink variants which quickly outgrew the 'typical' virulent, S yellow form. The dissociated normal strain, however, produced the R to S white variant only after leaching and it was quickly overrun by the S yellow, while the S pink variant appeared only after filtering. These results were demonstrated far better on Quirk's than on the common bacterial media. Filtrates of each strain transferred to nine such media resulted in growth on two only. In all subcultures from these two the R to S white variant was dominant.

Transfers from the scarcely visible, hyaline, finely roughened, pellicle-like colonies, produced from the filtrates of each strain, gave on medium iv an initial S growth of the R to S white variant followed by the S yellow form in the case of the normal strain and by the S greenish-yellow with $P(M+P)^{34}$. An S pink variant, occurring in the form of superimposed colonies, streaks, or sectors, and far more conspicuous in the $P(M+P)^{34}$ strain, appeared in second or third lineal transfers from the bacterial suspension in the filter tube in each strain. The 'typical' virulent S yellow form was recovered from the filtrate of each strain when transfers to Thaxter's potato dextrose agar were made from the filter tube after 10 days' incubation. Patches of S growth of the R to S white variant appeared in the case of $P(M+P)^{34}$.

All the dissociated cultures of each strain, including filtrates, showed some virulence in inoculation tests with Stringless Green Refugee seedlings, the severity of bacterial infection being directly proportional to the amount of the S yellow form in the inoculum. When the R to S white variant was dominant infection was poor or only moderate, rarely visible on the inoculated leaves, and more often than not only discernible by microscopic examination of the stem. The R to S white variant from the normal strain filtrate reverted to typical S yellow in the host within 10 days after inoculation. Some mosaic symptoms were induced by inoculations with filtrates of each strain, but it is considered that further work is necessary before it is proved that filtrates of *X. phaseoli* cultures can produce mosaic. The decrease in toxicity of *X. phaseoli* during its two years' association *in vivo* with bean-mosaic virus is considered to be due to the increased development of the weakly pathogenic R to S white and non-pathogenic S pink variants, which

resulted in the partial subordination of the virulent S yellow form of the bacterium.

The author believes that properties of virulence, mild virulence, and avirulence are inherent in all so-called 'typical' cultures of *X. phaseoli*, and the dominance of one or another may be determined by a number of factors both *in vitro* and *in vivo*. It is probable that an associated infective agent, if present, may play, either directly or indirectly, an important rôle.

HEDGES (FLORENCE) & FISHER (H.). **Association of Xanthomonas phaseoli and the common Bean-mosaic virus, Marmor phaseoli. III. The effect of varying amounts of nitrogen on pathogenicity.**—*Phytopathology*, xxxvi, 8, pp. 613–623, 1 fig., 1946.

The present investigation was undertaken to examine the effect of supplying varying amounts of nitrogen to bean plants infected with the disease complex, and the separate infective agents, *Xanthomonas phaseoli* and bean mosaic virus [cf. *R.A.M.*, xxi, pp. 169, 228, and preceding abstract]. Stringless Green Refugee Bean seedlings grown in sterilized, washed quartz sand were inoculated with (*a*) juice from the serial passages of bean juice containing both the bacterium and the virus, or (*b*) pure, single-colony cultures of *X. phaseoli* growing on steamed potato cylinders, or (*c*) juice containing the virus from serial passages of bean juice. Nutrient solutions made according to Spencer's formula (*Phytopathology*, xi, p. 770, 1921) and containing 9·8, 200, and 2,000 p.p.m. nitrogen, respectively, were supplied to the plants. For comparison, similar inoculations were made on plants growing in sterilized composted soil and non-inoculated plants were grown in both media.

The most virulent development of both virus and bacterium occurred with 200 p.p.m. of nitrogen in the medium. This was also the optimum for growth of the host, which developed root nodules in spite of the sterilization of the media. Pathogenicity tests with juice from all sets of plants inoculated with the disease complex (using juice $(M+P)^{57}$ from the 57th serial passage of bean juice containing the virus and 'typical' *X. phaseoli*) showed that the virus had not been inhibited by any of the three nitrogen concentrations, since the juice produced 100 per cent. good mosaic when tested on plants grown in composted soil. There was, however, a marked inhibition of the bacterium both by low and high nitrogen. When, however, isolates of the bacterium from the same three nitrogen sets were first grown on steamed potato cylinders and then used as inoculum, all were very virulent, although that from the medium nitrogen was markedly more so.

Some doubt is expressed as to the freedom of the pure virus from contamination with masked *X. phaseoli*.

BAKER (K. F.), SNYDER (W. C.), & HOLLAND (A. H.). **Lygus bug injury of Lima Bean in California.**—*Phytopathology*, xxxvi, 7, pp. 493–503, 2 figs., 1946.

Large and baby Lima beans [*Phaseolus lunatus*] and Blackeye cowpeas in California are liable to a necrotic pitting of the seed closely resembling that associated with yeast spot (*Nematospora coryli*) [*R.A.M.*, v, p. 202; xxiii, p. 207]. Field and greenhouse tests with the bugs *Lygus hesperus*, *L. elisus*, and possibly other species caged on Lima beans showed that the pits are caused by the toxic feeding of the insects on the developing reproductive organs. Injury from the bugs cannot be differentiated from yeast spot on the basis of symptoms alone.

WARINGTON (KATHERINE). **Molybdenum as a factor in the nutrition of Lettuce.**—*Ann. appl. Biol.*, xxxiii, 3, pp. 249–254, 1 pl., 1 graph, 1946.

Further experiments [*R.A.M.*, xxi, p. 317] on the effect of molybdenum (at 0·1 p.p.m. as sodium molybdate) on the growth of lettuce in nutrient solutions

have confirmed the beneficial effects resulting. As, however, this is not invariably so it is considered that some other factor, not yet discovered, is operating as well.

Le Beau (F. J.). **Fermate does control Cucumber anthracnose.**—*Food Packer*, xxvii, 8, pp. 67–68, 2 figs., 1 graph, 1946.

Two years' tests in Louisiana demonstrated the superiority of 10 per cent. fermate dust over Bordeaux mixture, tribasic copper sulphate, yellow cuprocide, and dithane in the control of cucumber anthracnose (*Colletotrichum lagenarium*).

Levadoux (L.). **Chronique du court-noué.** [A note on court-noué.]—*Progr. agric. vitic.*, cxxvi, 35–37, pp. 124–126, 1946.

The author cites a communication from a local grower stating that at Domerat (Allier), France, court-noué of the vine [*R.A.M.*, xxvi, p. 6] first appeared between 1930 and 1932, on the hybrid Seibel 4643. This variety was affected in all localities except those where the soil was extremely permeable. Fifteen years' observations have shown that Seibel 4643 has become affected (locally) wherever its roots have remained in water during the rainy season, the vines round such wet spots being unaffected. While the grower thought that the dry (and unaffected) areas were those which might be expected to favour *Phylloxera* [*vastatrix*], the author points out that the reverse is the case, the dry spots consisting of pure, rough sand which the insects avoid, while the wet spots are highly favourable to them, being more compact.

Further evidence by the grower supported the view that the less frequently a vineyard has been replanted since it was first reconstituted on American roots the less prevalent is court-noué. Vines grafted on plants resistant to *P. vastatrix* naturally remain unaffected longer than ungrafted vines whose resistance, particularly that of Seibel 4643, is very mediocre. The grower also pointed out that grafted vines planted in new soil have so far remained unaffected, as have vines grafted when under 20 years old in all soils.

The author concludes that the disease was introduced locally on Seibel 4643 cuttings and that it rapidly spread in places harbouring *P. vastatrix*, which are also those with the highest amounts of potassium.

Escafit (H.). **Mildiou. Une zone de foyers primaires, Laurens (Hérault).** [Mildew. An area of primary foci of infection, Laurens (Hérault).]—*Progr. agric. vitic.*, cxxvi, 35–37, pp. 134–137, 1946.

The author adduces reasons for the view that a permanent centre of primary infection by vine mildew [*Plasmopara viticola*] exists at Laurens, Hérault, where every year the first symptoms appear before they are present anywhere else in Languedoc. That the district does not suffer more severely from the disease than other areas in this part of France is attributed to the fact that intense drought prevails locally every June and arrests secondary infections.

Bosc (M.). **Sur la structure des noyaux et la méiose de Plasmopara viticola (Berk. et Curt.) Berl. et de Toni.** [On the nuclear structure and meiosis of *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni.]—*C. R. Acad. Sci., Paris*, ccxxiii, 16, pp. 584–586, 1946.

The study of fixed and stained material of *Plasmopara viticola* revealed a vegetative nucleus about 2μ in diameter, surrounded by a membrane which is retained throughout the process of division. When at rest it presents a central or subcentral karyosome, staining violet-blue with the reagent of Turchini *et al.* (*Montpellier méd.*, xxiii–xxiv, p. 599, 1943), an index of abundant thymonucleic acid. The several phases of mitosis of the vegetative nucleus are briefly traced. The antheridia, developing towards the end of the season, result from the terminal

extension of the mycelium and are clavate, measuring 40 to 50 by 20 to 25μ. The oogonia, originating in the same way, are roughly spherical and of an average diameter of 30μ. A nucleus of the antheridium fuses with one from the oogonium, the diameter of each being twice to 2½ times that of the other nuclei. The nuclear membrane at the point of contact between the two nuclei disappears and the karyosomes unite. The oospore remains in this stage until the spring. At the quadrinuclear phase in the mitosis of the reproductive nucleus it was possible to discern 14 to 16 chromosomes, i.e., about double the number contained in the vegetative nucleus.

From these data it is concluded that the nuclei of the mycelium and conidia are haploid, while those of the oospore and of the early stages of division of the reproductive nucleus are diploid. Chromatic reduction, therefore, would not occur at the first division of the reproductive nucleus, as assumed by Arens [*R.A.M.*, ix, p. 59], but at the phase of 8 to 16 nuclei. Moreover, the nuclei of the ephemeral diploid generation undergo normal karyokinesis, in contrast to the promitotic type of the vegetative nuclei. This structural difference between the haploid and diploid nuclei is believed to be here reported for the first time.

MULDER (D.). **Afsterving van Kasdruiven door Phomopsis spec.** [Die-back of hothouse Grapes caused by *Phomopsis* sp.]—*Tijdschr. PlZiekt.*, xlvii, 3, pp. 120–129, 2 pls., 1941. [English summary. Received November, 1946.]

The pycnospores of the species of *Phomopsis* isolated from Gros Colman vine stems affected in Dutch hothouses by a disease resembling the 'dead arm' (*Cryptosporella viticola*) of the United States [*R.A.M.*, xvi, p. 299; xxiv, p. 3] measure 5·7 to 7·4 by 1·8 to 2·3μ, and those from the Alicante and Frankenthaler varieties 6·9 to 1·8μ. The relationship, if any, between the *P.* sp. of Holland, the *P.* sp. isolated from vine by Goidànich in Italy [ibid., xvii, p. 288], and *C. viticola* has not yet been investigated. The symptoms of the Dutch disease include a partial wilt and die-back and the presence on the stems of the 'longitudinal ribbed excrescences' described by Reddick. The *Phomopsis* probably enters the vines through pruning wounds inflicted with a contaminated knife, the mycelium presumably providing the bulk of the inoculum since pycnospores are only scantily produced in Holland. Tumours caused by *Bacterium tumefaciens* and a *Sphaeropsis* sp. are sometimes associated with the die-back.

HOPKINS (J. C. [F.]). **Two diseases recorded for the first time in Southern Rhodesia.** —*Int. Bull. Pl. Prot.*, xx, 9–10, p. 80M, 1946.

Potato late blight (*Phytophthora infestans*) and tobacco Granville wilt (*Xanthomonas solanacearum*) are reported for the first time from Southern Rhodesia. The former caused no serious loss, and the latter is confined to two closely situated farms.

HOPKINS (J. C. [F.]). **Annual Report of the Branch of Plant Pathology and Botany for the year ending 31st December, 1945.**—*Rhod. agric. J.*, xliii, 4, pp. 333–343, 2 figs., 1946.

In this report on plant disease work in Southern Rhodesia in 1945 [cf. *R.A.M.*, xx, p. 448] it is stated that the most important record of the year was the discovery of *Phytophthora infestans* [see preceding abstract] on potatoes in the Salisbury district, the diagnosis being confirmed by the Imperial Mycological Institute. Other new records include *Zinnia* leaf spot (*Cercospora zinniae*) [ibid., xxiv, p. 388], apple bark canker (*Myxosporium corticola*) [ibid., xvii, p. 586; xxiii, p. 476], grapefruit smoky blotch (*Stomiopeltis citri*) [ibid., xiii, p. 693], and leaf spot of *Nicotiana alata* var. *grandiflora* (*Alternaria longipes*).

WATERSTON (J. M.). **Report of the Plant Pathologist, 1945.**—Department of Agriculture, Bermuda, 12 pp., 1946.

Among other items of phytopathological interest contained in this report [cf. *R.A.M.*, xxiv, p. 306], it is noted that the spread of *Xanthomonas campestris* on cabbage and cauliflower [ibid., xxiii, p. 5], favoured by heavy autumn rainfall, caused heavy loss. On 27th October, 1945, a fine fructification of *Polyporus graminicola* was observed at the Agricultural Station on dead bamboo (*Dendrocalamus strictus*), constituting a new substrate record. *Phytophthora parasitica* was early reported on St. David's Island on the Howardii variety of Easter lily (*Lilium longiflorum* var. *eximium*) causing losses of 27 to 50 per cent. in some fields. It was spread by heavy rain washing soil into the emerging shoots, and highest incidence occurred in plants growing along the edges of paths where surface water tended to run off and collect. Spraying with Bordeaux provided effective control. *Rhizoctonia* [*Corticium*] *solani* was observed on tomato seedlings at the Agricultural Station on 7th November, 1945, apparently a new host record for Bermuda.

Department of Plant Pathology.—*Rep. Del. agric. Exp. Sta., 1944–5* (*Bull.* 259), pp. 33–39, 1945.

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, xix, p. 388]. One hundred selected strawberry seedlings, grown in 1943 from the resistant varieties Aberdeen and Pathfinder, were tested by T. F. MANNS during 1945 for resistance to red stele [red core (*Phytophthora fragariae*): ibid., xxiv, p. 325] and for commercial value. Several thousand progeny from two seedlings, Aberdeen D9A and D207A, were set out for limited trials in 1945, the former strain having shown great resistance to frost injury.

In experiments by J. W. HEUBERGER on the control of soy-bean diseases dithane, applied as a soil treatment at 100 lb. per acre at planting time, severely damaged the seed. The practice in Delaware of growing Lima beans [*Phaseolus lunatus*] after peas in the same year has been found to entail some risk of damping-off and root-rot troubles. Spergon and arasan proved equally effective for controlling Lima bean seedling diseases, but significant increases of stand from such treatments occurred only in tests on land previously cropped with peas in the same year. Spergon was also the best seed treatment for peas and soy-beans [ibid., xxv, p. 379].

J. W. HEUBERGER and T. F. MANNS record that in 1943 dithane plus zinc sulphate-lime excelled other fungicides in the control of early blight of late red potatoes [*Alternaria solani*: ibid., xxiv, p. 69; xxv, p. 415], promoted the most vigorous top growth, and gave the maximum yield, significantly higher than Bordeaux mixture. Dithane used alone gave poor results. Zinc sulphate added to copper compound A conferred similar protection.

Field tests conducted by J. W. HEUBERGER on tomato and potato showed that zerlate was a significantly better fungicide than any of the other dimethyl dithiocarbamates for the control of early blight. It was also the best for controlling anthracnose [*Colletotrichum phomoides*: ibid., xxvi, p. 36] on tomatoes, and equal to Bordeaux mixture in combating *A. solani* on potatoes and tomatoes. The position of the salt in the electromotive series was found to condition the effect on the fungicidal power of adding zinc sulphate-lime to metallic dimethyl dithiocarbamates (zinc salt excepted), those above zinc being most affected and those below least. Thus, increased control was recorded for the calcium, sodium, and iron salts, but not for those of copper and lead. The copper salt was the only one causing injury, which was severe in both tomato and potato. The above advantages of zerlate, and the fact that it controls leafhopper injury on potatoes better than Bordeaux mixture, suggests that it may replace copper fungicides now in use.

Compounds [U.S.R.] 604 and A03 were promising as foliage sprays for controlling early blight on tomato and potato, and anthracnose on tomato, being superior to standard fixed copper materials.

The entirely satisfactory control of damping-off of peas by dithane and by calcium dimethyl dithiocarbamate has led to further investigation of their use as soil treatments for controlling seed-borne diseases.

S. L. Hopperstead, T. F. Manns, and J. W. Heuberger showed that for the control of apple scab [*Venturia inaequalis*] and brown rot of peaches [*Sclerotinia fructicola*] puratized N5–X [ibid., xxiv, p. 138], used at 1 to 1,000 (1 to 8,600 active ingredient) and 1 to 2,000 (1 to 17,200), was slightly superior to standard-strength lime-sulphur. Isothan Q15 [ibid., xxiv, p. 443] at 1 to 1,000 (1 to 5,000 active ingredient) and fermate at ½ lb. plus half-strength micronized sulphur were equal to the standard wettable sulphurs.

Compound 604 at 1 lb. to 100 gals. controlled apple scab on the Delicious and Rome varieties, but severe fruit injury resulted from heavy residues. Dithane at 0·45 to 1·8 lb. alone or with zinc sulphate-lime proved unsatisfactory against scab and alone caused foliage injury.

In initial tests on peaches isothan Q15 provided safe and thorough control of brown rot. Puratized N5–X did damage and fermate, while adequate in control, left objectionable colour residues.

Fawcett (G. L.). **Departamento de Botánica y Fitopatología.** *Ex* **Memoria anual del año 1944.** [Department of Botany and Phytopathology. *Ex* Annual Report for the year 1944.]—*Rev. industr. agríc. Tucumán*, xxxvi, 1–3, pp. 57–60, 1 fig., 1946.

The extensive investigations on sugar-cane smut (*Ustilago scitaminea*) carried out during the period covered by this report [cf. *R.A.M.*, xxv, p. 28] have been described in part in a bulletin of the Tucumán Agricultural Experiment Station [ibid., xxiv, p. 73].

An unthrifty condition of oranges signalized by foliar stunting is attributed to an excess of sodium chloride in the irrigation water. Normal new growth was made by affected plants transferred to non-irrigated sites.

During 1943–4 potato plants for the first time developed a marked necrosis of the upper stem region, the juice of which, inoculated into tobacco, induced the typical symptoms of 'corcova' [tomato spotted wilt virus]. Another potato disease, possibly of virus origin, caused elongation of the stem, drooping of the plants to a level with the ground, chlorosis of the apical leaves, and a poor crop of under-sized tubers.

Alibert (H.). **Une nouvelle maladie, le swollen-shoot. Les Cacaoyers d'Afrique en péril.** [A new disease, swollen shoot. The African Cacao plantations threatened.]—*Atomes, 1946*, 6, pp. 23–26, 6 figs., 1 map, 1946.

This is a summary of the available information on cacao swollen shoot, with special reference to its extension from the Gold Coast to the Ivory Coast and the two main forms assumed by the virus in the latter territory [*R.A.M.*, xxv, p. 549].

Cheesman (E. E.). **Interim report on Cacao research 1944–45. Results of Cacao experiments in 1944–45.**—*Trop. Agriculture, Trin.*, xxiii, 4, pp. 63–65, 1946.

In field trials in Trinidad the standard cacao clone ICS 1 has proved to be the most generally satisfactory of all those tested. It is susceptible to witches' broom [*Marasmius perniciosus*: *R.A.M.*, xxv, p. 296], as are all the Trinidad selections, but within the range of variation shown in this respect by the ICS series it ranks as relatively resistant. ICS 6 possesses the advantage of losing only a small percentage of its pods through *M. perniciosus* (even less than ICS 1), but it shows more virus infection [ibid., xxvi, p. 48] than any other clone in CRB 1. ICS 8

produces more pods than ICS 1 but loses more than twice as many from witches' broom; in spite of this, it is a first-class clone suitable for commercial planting wherever incidence of the disease is not heavy. ICS 45 (Criollo) shows very small loss of pods and is of great promise. ICS 60 shows a high rate of cushion infection by witches' broom, but pod loss is not unduly high, and the clone is well worth commercial trial.

STAKMAN (E. C.). **Plant pathologist's merry-go-round. A survey of the never-ending battle against plant diseases.**—*J. Hered.*, xxxvii, 9, pp. 259–265, 1 pl., 4 figs., 1946.

In this condensed report of a lecture delivered to the Society of Sigma Xi of the United States, the author briefly reviews the fluctuating importance of wheat diseases in response to changes in cultivation, climate, host varieties, and fungus strains. The resistance-susceptibility scale used in grading the virulence and detecting the distribution of physiologic races of the wheat stem rust fungus (*Puccinia graminis tritici*), the hybridization of maize smut [*Ustilago maydis*] races, and variations in virulence of mutants of *Helminthosporium sativum* are described to illustrate the complex and unending problems which confront plant pathologists.

BUTLER (F. C.). **Stem rust of Wheat.**—*Agric. Gaz. N.S.W.*, lvii, 9, pp. 483–487, 4 figs., 1946.

Throughout the wheat belt proper of New South Wales, stem [black] rust of wheat (*Puccinia graminis tritici*) is of considerably more importance than leaf [brown] rust [*P. triticina*] in the reduction of yields, but in the coastal areas, where the crop is grown for fodder, the position is reversed. In 1916 the losses from black rust in the State were computed at £2,000,000, while the average annual loss over the 20-year period from 1918 to 1938, during which particularly heavy tolls were taken in 1920, 1925, 1930, and 1934, was estimated at £250,000. Further severe outbreaks occurred in 1939 and 1942.

Fallowing and superphosphate soil amendments, which tend to accelerate maturity, may sometimes obviate serious damage from rust infection. The growing crop should not be irrigated, since this practice assists in the spread of the pathogen: it is preferable to flood the land first, and then conserve moisture by cultivation. Rust-resistant varieties available for distribution to farmers include Celebration, Charter, Cabo, Kendee, and Yalta.

MARCHIONATTO (J. B.). **Factors which lowered the Argentine Wheat yield in 1945.**—*Int. Bull. Pl. Prot.*, xx, 9–10, p. 81M, 1946.

During 1945 the wheat yield in Argentina was lowered by several factors of a climatic or parasitic nature, particularly drought. Delayed growth was particularly marked in the early varieties, such as Sinvalocho M.A. and 38 M.A. [*R.A.M.*, xxi, p. 187], which eared late and were exposed to a greater extent than others to infection by *Puccinia graminis* and *Fusarium graminearum* [*Gibberella zeae*]. At the start of spring and before the rains in the Pergamino area, the wheat, then in the milky stage, assumed the 'arrebatado' aspect characterized by the formation of large tufts of mature plants with white ears. The phenomenon gradually became general and the wheat showed premature maturity. At the same time, a preliminary attack of *G. zeae* took place; this occurs every year during earing. The environmental conditions favoured fungal attack first at the foot, then in the roots. This form of infection, virtually unknown in Argentina, was noted on wheat from Uruguay, where the disease was serious. The damage caused by *G. zeae* was increased by that due to *P. graminis*, which became widely prevalent in November.

STOUT (H. L.) & JOHNSON (A. G.). **Frost injury to Wheat heads.**—*Plant Dis. Reptr*, xxx, 10, p. 370, 1 fig., 1946. [Mimeographed.]

During May, 1946, wheat heads over a considerable area in western Kansas and to some extent in central Nebraska developed frost injury. At the Garden City Branch Station, Kansas, the temperature was 27° F. for two hours on the morning of the 11th. Comanche wheat on the rotation plots was in head, and an average of about 70 per cent. of the florets were killed. Those past the blooming stage developed normal kernels and also those at the tip or base of the spike, or both, which were probably in the pre-bloom stage. Kernels one-half to two-thirds developed were mostly killed, and such kernels at harvest were much shrunken, almost devoid of starch, feather-light, and non-viable.

STEVENSON (J. A.) & JOHNSON (A. G.). **The nomenclature of the Barley leaf rust.**—*Plant Dis. Reptr*, xxx, 10, p. 372, 1946. [Mimeographed.]

The authors accept Buchwald's view that the valid name for the barley leaf rust (*Puccinia simplex* (Körnicke) Erikss. & Henn. or *P. anomala* Rostr.) is *P. hordei* Otth [*R.A.M.*, xxv, p. 107], and they list among the synonyms *Aecidium ornithogaleum* Bub. and *Dicaeoma anomalum* Arth. & Fromme. The dwarf or brown leaf rust [ibid., xvii, p. 593], for which Buchwald proposed the name *P. hordei-murini* [loc. cit.], is present in the United States from Oregon to southern California on *Hordeum murinum* and related species.

MEEHAN (FRANCES) & MURPHY (H. C.). **A new Helminthosporium blight of Oats.**—*Science*, civ, 2705, pp. 412–414, 1946.

A blight affecting mainly varieties and selections of oats (*Avena sativa, A. byzantina*, and their hybrids) with the Victoria type of resistance to crown rust (*Puccinia coronata avenae*) was reported in 1946 from 19 States of the American Union between Texas and New York and from Florida to Idaho, the severe infection in many areas causing serious yield reductions. The first isolation from oats was made in November, 1944, but the fungus, to which the name *Helminthosporium victoriae* n.sp. is assigned, had previously been isolated from timothy [*Phleum pratense*] seed.

Plants attacked in the seedling stage showed basal necrosis and foliar striping or reddening, proceeding from the lower leaves upwards. The same symptoms were characteristic of plants infected at a later stage of maturity, but in such cases identification of the disease was based on the stem base and root rot, since the foliar symptoms might be attributable to various causes: in the blighted oats they are probably a secondary toxic effect of the basal decay. Mature field plants were blackened at the nodes by abundant sporulation, and the lower internodes showed a characteristic brownish translucence. Culms weakened by severe infection collapsed near ground-level and at the lower nodes, while harvesting was frequently complicated by excessive lodging.

The conidiophores of *H. victoriae* are erect, simple, emerging usually singly, rarely in clusters of two to five, from the stomata or between the epidermal cells of diseased culms, pale olivaceous to medium-brown, 60 to 280 by 5·8 to 10, mostly 120 to 160 by 6·5 to 7·8 μ, with 4 to 10, generally 6 to 8 septa; the rather closely geniculated, apical spore-producing area is 30 to 80 μ in length. The fuliginous to dark olivaceous, typically pale olivaceous, slightly curved, rather thin-walled conidia, tapering to a rounded tip, measure 40 to 130 by 11 to 25 (70 by 15) μ and are provided with 4 to 11 (8) septa. Germination is effected by one polar germ-tube from each terminal cell. Conidia produced on water agar are somewhat below normal size and have fewer septa than those formed on the host, while weathered spores on the bases of field plants are often dark brown and of irregular shape,

with a thick exospore. The typical colonies on oat agar cultures are pale to medium-grey and tufted; the growth of a profusely sporulating saltant strain is dark greenish-black. The species also occurs as a saprophyte or weak parasite on *P. pratense, Dactylis glomerata,* sorghum, *Agropyron cristatum, Setaria viridis,* barley, *Paspalum notatum, Chloris gayana,* and soy-bean.

SAHA (J. C.). **Sphacelial stage in the life-history of Claviceps purpurea (Fr.) Tul.**—*Nature, Lond.*, clviii, 4024, pp. 881–882, 2 figs., 1946.

For the last two years the writer has secured constant yields of ergot (*Claviceps purpurea*) sclerotia [on rye] by artificial methods of production in the tropical plains of Bengal [*R.A.M.*, xxiv, p. 499]. Under these conditions the sphacelial (conidial) phase of the fungus did not end with the usual 'honey-dew' stage within a fortnight of the initiation of sclerotium formation but persisted up to the time of harvesting on the sides of the crevices near the base where small drops of spore-containing 'honey' were detected. The spores of this secondary sphacelial stage were comparable in all respects, including viability, with those of the primary.

Sclerotia stored in slightly damp glass-stoppered bottles were soon overrun by a white, downy growth consisting mainly of conidia of *C. purpurea*, together with a few mycelia. These spores were longer than those of the 'honey-dew' stage.

The high temperature and humidity prevailing from January to April, 1946, when these observations were made, appear to favour the extension of the sphacelial stage of *C. purpurea.*

HIRSCHHORN (ELISA) & HIRSCHHORN (J.). **Formas fisiológicas en 'Ustilago zeae' de diversas localidades de la Argentina. Su caracterización geográfica.** [Physiologic races in *Ustilago zeae* from different localities of Argentina. Its geographical characterization.]—*Physis, B. Aires*, xviii, 50, pp. 181–222, 7 pl. (6 col.), 7 diags., 1939. [Received September, 1946.]

An exhaustive, fully tabulated account is given of the authors' studies on seven populations of maize smut (*Ustilago zeae*) [*U. maydis*] from seven localities of Argentina [see next abstract]. The material yielded 510 physiologic races, of which 465 differed among themselves in some or all of their cultural characters, falling into four groups, viz., I from Santa Rosa de Toay (La Pampa) and La Plata, II from Sola (Entre Ríos) and La Estanzuela (R.O. del Uruguay), III from Los Cardones (Tucumán) and Naschel (San Luis), and IV from Macomitas (Tucumán). The last-named differs from all the others in the predominance of grey over beige in its colonies and the large number of colours or shades developing exclusively in cultures of this provenance, namely, pale cinnamon, cacao, yellow-purple, mole-grey, lava-grey, and neutral olive.

HIRSCHHORN (ELISA) & HIRSCHHORN (J.). **Acción del pH sobre los caracteres culturales del carbón del Maíz 'Ustilago zeae' (Beck) Ung.** [Action of the pH on the cultural characters of Maize smut *Ustilago zeae* (Beck) Ung.]—*Physis, B. Aires*, xv, 50, pp. 223–251, 11 pl. (9 col.), 11 graphs, 1939. [Received September, 1946.]

For the majority of the monospore cultures of maize smut (*Ustilago zeae*) [*U. maydis*], comprising 33 from each of the seven Argentinian populations under observation [see preceding abstract], an initial pH of 8·1 appeared to be optimal for increase in diameter on Ranker's synthetic medium [*R.A.M.*, x, p. 95]. At pH 3·1 the superficial expansion of the colony is arrested and there is a marked increase in thickness, pallor of colouring, a rough or downy surface, a well-defined margin, brittle consistency, and predominance of the mycelial over the sporidial growth type. The production of mutants begins at pH 5·5 and reaches a maximum at 8·1.

SHANDS (H. L.) & SCHALLER (C. W.). **Response of spring Barley varieties to floral loose smut inoculations.**—*Phytopathology*, xxxvi, 7, pp. 534–548, 1946.

Of the various methods tested for the inoculation of barley with loose smut (*Ustilago nuda*) [*R.A.M.*, xxv, p. 552] at the Wisconsin Agricultural Experiment Station, the most effective and convenient consisted in the injection of dry chlamydospores from a rubber bulb into the inflorescences by means of a hypodermic needle. Of the 300 varieties from the C.I. collection comprised in the trials, which have been in progress for about ten years, eight of Abyssinian origin fell into the lowest infection group (0 to 3 per cent.), compared with one each from Australia and Manchuria, three from China, and two from India. Included in the 4 to 15 per cent. class were eight from Manchuria, seven from Abyssinia, three each from Asia and Northern Europe, two each from Australia, Japan, the Middle East and North Africa, and six from India. Of the 22 Egyptian varieties tested, 18 were highly susceptible (61 to 100 per cent. infection), and a similar reaction characterized 13 of the 23 North African. Eight Russian varieties fell into the highest infection class, 11 into the 31 to 60 per cent., and four into the 16 to 30.

Of 24 commercial varieties tested, the most resistant were Trogal, Warrior, Trebi, and Manchuria O.A.C. 21, with 0, 0, 4, and 15 per cent. infection, respectively, and the most susceptible Kindred, Missouri Early Beardless, Plush, Nerval, and Mars (78, 74, 71, 68, and 64, respectively).

Some of the selections from the breeding programme are resistant to loose smut, smooth-awned, and generally desirable from an agronomic standpoint, and efforts are in progress to combine these properties with superior malting quality.

CHOWDHURY (S.). **Some studies on the smut, Ustilago coicis Bref., of Job's Tears Millet.**—*J. Indian bot. Soc.*, xxv, 3, pp. 123–130, 1 pl., 1 fig., 1946.

Job's tears millet (*Coix lachryma-jobi*) is widely grown for human consumption and poultry feed in Assam, where it is subject to severe infection by *Ustilago coicis*, which converts every grain of the head into a black spore mass, enveloped in a membrane hidden by the glumes, and completely destroys all the ovaries in a raceme. In the Khasi Hills the damage usually ranges annually from 12 to 25 per cent. of the crop and may exceed 35 per cent. The optimum temperature for spore germination is about 30° C. and the optimum pH 6·4. Seed-borne spores are the principal source of infection, and experiments were accordingly carried out in 1943 to determine the value as a control measure of seed treatment with agrosan G, ceresan, formalin dust, and copper carbonate dust. None of the fungicides completely eliminated the smut, but all reduced its incidence to insignificant proportions, copper carbonate being the most effective with a mean infection percentage of 0·25 as against 30 in plants from untreated seed. Almost exactly comparable results were obtained in 1944.

DEVARAJAN (M. R.). **Powdery mildew of Oranges in Coorg.**—*Indian Fmg*, vii, 6, pp. 303–304, 1946.

Dr. B. B. Mundkur supplied the following information on specimens of Loose Jacket orange leaves severely infected by a powdery mildew in Coorg, where the disease assumed major importance in 1943 over the 12,000 acres under cultivation in the province. The fungus was present only in the form of hyaline, oval, or slightly barrel-shaped conidia, 25 to 42 by 11 to 17μ, with rounded or somewhat flattened appressoria. These measurements approximate closely to those given by Petch (36 to 42 by 15 to 18μ) for a powdery mildew of citrus in Ceylon (*Phytopathology*, v, p. 350, 1915; ix, p. 266, 1919), and by Fawcett [*R.A.M.*, xv, p. 574] for the same disease in Java, and considerably exceed those reported by Carter (*Phytopathology*, v, pp. 193–195, 1915), for *Oidium tingitaninum* [*R.A.M.*, xviii, p. 794]

in California. In view of these important discrepancies, Dr. Mundkur cannot subscribe to Fawcett's opinion that the oriental and occidental species of *Oidium* are identical, nor does he accept Butler and Bisby's record of *O. tingitaninum* for India [ibid., xi, p. 545]. The Indian *Oidium* is as yet undetermined and should be designated *O.* sp. Good control was effected by dusting with sulphur.

GONDELL (M. A.). **La susceptibilidad de diferentes especies y variedades cítricas a la Phytophthora citrophthora (Sm. y Sm.) Leon., P. parasitica Dastur, y P. megasperma Leon. en la zona de Concordia (Entre Ríos).** [The susceptibility of different Citrus species and varieties to *Phytophthora citrophthora* (Sm. & Sm.) Leon., *P. parasitica* Dastur, and *P. megasperma* Leon. [in error for Drechsler] in the region of Concordia (Entre Ríos).]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, ii, 19, 24 pp., 7 figs., 1946.

All the citrus species and varieties, comprising 16 of sweet orange, two each of mandarin and grapefruit, and one each of lemon, citron, lime, kumquat (*Fortunella* spp.), and bitter orange, inoculated by Klotz and Fawcett's technique [*R.A.M.*, x, p. 98] with *Phytophthora citrophthora* and *P. parasitica* [ibid., xxiii, p. 105; xxiv, p. 500; xxv, p. 55] were more or less susceptible. Those reacting with the most severe symptoms were the Real lemon, the common mandarin, and the Nagami kumquat; the Washington Navel was the most susceptible of the oranges. There were no differences in the effects induced by the two fungi on their hosts except for the more intensive production of gum by *P. parasitica*. *P. megasperma* [ibid., xxiii, p. 294] was pathogenic to three only of the sweet orange varieties, both those of grapefruit tested, and the kumquat.

In general, the writer's results agree with those obtained by other workers along the same lines.

CHAPMAN (H. D.), VANSELOW (A. P.), LAURANCE (B. M.), & LIEBIG (G. F.). **Soil and nutritional studies in relation to quick decline of Oranges.**—*Calif. Citrogr.*, xxxi, 12, pp. 460–461, 470–472, 3 figs., 1946.

An exhaustive series of experiments on the nutritional aspects of quick decline of oranges [*R.A.M.*, xxv, p. 559], set up to determine whether (1) this disorder is due to some nutritional deficiency or excess, (2) nitrite or any other soil-produced toxin may be involved, and (3) any single or combined fertilizer or soil amendment would alter the course of the disease, led to the conclusion that some factor other than nutrition is the primary cause of quick decline. Nothing was observed to show that toxic substances such as nitrite are in any way involved, nor did it appear that the course of the disease is appreciably altered by any of a considerable number of fertilizer treatments. As, however, insufficient time has elapsed for final judgment to be attempted on many of these treatments, the authors limit themselves to considering it remotely possible that some as yet undiscovered nutrient element may be involved. Many diseased Navel orange trees in the Covina area developed considerable foliage growth in the autumn of 1945, the new leaves at first being green and healthy. Later, however, they faded and a characteristic vein chlorosis appeared which has persisted for some 10 months. This behaviour is characteristic of the 'tristeza' disease of South America [ibid., xxvi, p. 12].

HAAS (A. R. C.) & ZENTMYER (G. A.). **Control of chlorosis in Citrus leaves.**—*Calif. Citrogr.*, xxxi, 9, pp. 334–335, 346–348, 4 figs., 1946.

Chlorosis of citrus trees is usually found wherever there are alkaline calcareous soils [cf. *R.A.M.*, xxv, p. 559] and also on acid sandy soils in Florida, where iron deficiency may exist. High soil moisture content in calcareous soils over long periods is the most frequent causal factor. Warm autumn weather and a high

nitrogen status may promote late growth, which may fail to turn green during subsequent cold, wet weather, the latter also serving to reduce the availability of iron. Deep cultivation also tends to increase chlorosis.

Having discussed measures formerly adopted for the control of chlorosis in citrus trees [ibid., xiv, p. 753], the authors recommend fermate sprays and dusts as a useful source of iron. A uniform deposit of active iron over the leaf and axils of the petioles is essential to good control and is aided by a spreader or sticker. Iron solubility of the spray deposit is facilitated by adjusting the water to about pH 5 and adding sulphur in amounts not likely to cause burning. Sulphur is also a useful adjuvant in dust applications. Magnetite has been similarly used with success in controlling chlorosis. General improvement of advanced chlorosis in Valencia orange and lemon leaves was recorded 11 days after dusting with fermate or magnetite combined with sulphur. The use of acidifying instead of alkalizing agents as a means of maintaining the availability of the iron should increase the effectiveness of the control.

WARDLAW (C. W.). **A wilt disease of the Oil Palm.**—*Nature, Lond.*, clviii, 4002, p. 56, 2 figs., 1946.

In widely separated areas of the Belgian Congo 4- to 20-year-old oil palms showed necrotic symptoms in the vascular strands of the trunk and roots, the vessels of which became blocked by hyphae and gum. The lower leaves wilted, broke near the base of the petiole, and hung down in a cluster round the trunk. The younger leaves became successively affected, and finally the entire crown was killed and the tree died. Occasionally the leaves were yellowish. Observations indicated that infection occurred, apparently, through the roots or basal trunk wounds. The vascular strands turn greyish-brown to black, first at the periphery and then progressively inwards and upwards to the bases of the crown leaves. The same species of *Fusarium* [see next abstract] was isolated from affected material in various localities. As the disease has already caused considerable loss in various plantations, it requires prompt investigation from every angle.

WARDLAW (C. W.). **Fusarium oxysporum on the Oil Palm.**—*Nature, Lond.*, clviii, 4020, p. 712, 1946.

Dr. W. L. Gordon, of the Dominion Laboratory of Plant Pathology, Winnipeg, has determined as *Fusarium oxysporum* forma a culture of the species isolated by the author several times from oil palms in the Belgian Congo attacked by a vascular wilt disease [see preceding abstract]. Its pathogenicity remains to be tested. A culture of a *Fusarium* isolated from the characteristic leaf disease known locally as patch yellow [*R.A.M.*, xxii, p. 248], to which some genetical types of palm are apparently highly susceptible, has also been identified by Dr. Gordon as a form of *F. oxysporum* closely resembling the wilt strain apart from some differences on certain media.

VENKATARAYAN (S. V.). **The mycology section.**—*Mysore agric. J.*, xxiii, 2, pp. 58–60, 1945.

In his contribution to the Silver Jubilee Number of the Mysore Agricultural Journal the author comments on some outstanding features of the Mysore Agricultural and Experimental Union's 25-year campaign against plant diseases. An important problem in connexion with the koleroga disease (*Phytophthora arecae*) of areca palm is the existence of alternate hosts of the pathogen, two of which, sandal and *Jatropha* [*curcas*: *R.A.M.*, xxiv, p. 99], are of economic interest, the former as a valuable source of revenue to the State and the latter as a useful fruit.

Mention is made of the progress on coffee black rot (*Corticium koleroga*) and leaf rust [*Hemileia vastatrix*] problems at the Balehonnur Experiment Station [ibid., xxv, p. 448], and of other diseases requiring attention in the State.

VENKATARAYAN (S. V.). **Bud-rot of Areca Palms and 'hidimundige' in Mysore.**—*Nature, Lond.*, clviii, 4024, p. 882, 1946.

Thirumalachar's recent attribution of 'hidimundige' of areca palms to nematode [*Aphelenchus* ? *coccophilus*] infestation [*R.A.M.*, xxv, p. 161] is not accepted by the author, who maintains that the Hirethota [presumably 'hidimundige'] disease differs from red ring of coco-nuts in several important respects. He further deplores the use of the term 'bud rot' for the eelworm disease. He recalls his previous description of the 'hidimundige' disease in Mysore [ibid., xv, p. 77] and states that the diseased tissues are occupied by a saprophytic *Fusarium* and some bacteria. In some cases an Enchytraeid worm was present but its pathogenicity was doubtful.

CHOWDHURY (S.). **A leaf spot of Borassus flabellifer L. caused by Pestalotia palmarum Cke.**—*J. Indian bot. Soc.*, xxv, 3, pp. 131–137, 1 pl., 1 fig., 1946.

Borassus flabellifer, extensively grown in Assam for its fruit and also for the manufacture of fans from the leaves, is liable to a serious foliar spotting caused by *Pestalotia palmarum*, previously reported on the same host by Uppal *et al.* from Bombay [*R.A.M.*, xiv, p. 654] and by Mundkur and Kheswalla from Bengal and Bihar [ibid., xxi, p. 504]. A three-year survey of the disease in Assam showed that severe leaf infection impairs the fruiting capacity of the plant, besides appreciably reducing the value of the foliage for manufacturing purposes.

The tissues of the yellowish-brown, cream, or darker central region of the spots are abnormally thin and are surrounded by a 1-mm. greyish-brown band. In advanced stages of the disease the lesions may measure up to 5 by 1 or more cm., the centre turning grey and the brown margin darkening. Two to five or more spots may coalesce into irregular, grey, necrotic areas, and on the upper leaf surface the globose, spherical, rectangular, or ovoid, tar-black pycnidia, 130 to 420μ in diameter (85 to 240μ in oatmeal agar cultures), are formed on the centres. *P. palmarum* grew profusely on oatmeal agar, fairly so on maize meal, and sparsely on potato dextrose agar, with well-defined zonation on all substrata. It tolerated a temperature range from 15° to 35° C., with an optimum at 25° to 30°.

Inoculation experiments with monospore cultures of the pathogen on its own host, *Areca catechu*, coco-nut [ibid., xv, p. 15], and *Phoenix sylvestris* were successful only through wounds. The fungus was re-isolated each time.

The fungus survives from one season to the next on diseased leaves on the ground, and fresh primary infections are due to the conidia, which are disseminated by wind and rain. These organs measure 14·4 to 21·6 by 4·7 to 7·2μ in nature and 11·7 to 28·3 by 3·3 to 6·7μ in culture, and are brown, fusiform, curved, quadriseptate, the three middle cells dark and those at the extremities colourless, provided with a short, hyaline, persistent pedicel at the lower end and three, rarely four, colourless appendages, 7·2 to 25·2μ long in nature and 4 to 28·3μ in culture.

Control may be effected by the systematic collection and burning of the diseased foliage, supplemented by fortnightly prophylactic treatments with 2–2–50 Bordeaux-resin-soda mixture.

WELLMAN (F. L.). **Observations on Coffee root rot in El Salvador.**—*Plant Dis. Reptr*, xxx, 7, pp. 247–252, 1946. [Mimeographed.]

Three years' observations on coffee root rot [*R.A.M.*, xvi, p. 657] in El Salvador showed that the most salient symptom is the rapid wilting and death of large, apparently healthy trees. The wilt occurs during the rainy season and is often so

rapid that only a few leaves are shed. The leaves droop, become yellowish-green with bronze and tan markings along the veins or midrib, and soon shrivel. After the dry season has become well advanced, this wilt and collapse do not occur in the drier situations. The fruits mature poorly, and if wet conditions persist, they show numerous infections by *Cercospora coffeicola* [ibid., xxiv, p. 128] and *Colletotrichum coffeanum* [*Glomerella cingulata*: ibid., xxv, p. 154]. Many of the fibrous roots disappear and the larger roots are often partly consumed by decay. Some are covered by a white fungal growth, in others red, dark, or light rhizomorphs are present; in others only shredded remains are left; and in some, all but the fibrous roots are almost intact, though dead. The cause of this root rot has not yet been ascertained, but further work is in progress.

Serious economic loss results when trees in full bearing have to be removed because of root rot, particularly if replanting also fails. Figures obtained from one group of growers showed that from January to November, 1945, an average of 1,262 trees was removed from each of nine plantations, each of an average area of over 88 acres. Affected trees at first occur singly or in a small group forming a centre of infection; other trees then die off round this centre or along the rows in which the disease first appeared. In general, spread takes place from a centre outwards in all directions in moderately level soil, along rows planted on the contour of steep slopes, and downwards from row to row on such slopes.

Attempts at control (by the growers) made by removing diseased trees, filling in the holes with fresh soil, with or without lime or calcium carbide or fertilizers, by trenching round affected areas, and by burning the soil had little effect in arresting the disease or preventing its appearance in replants. There was, however, some evidence that Robusta coffee is highly tolerant of the disease.

CHESTER (K. S.). **The loss from Cotton wilt and the tempo of wilt development; a study of new uses for old data.**—*Plant Dis. Reptr*, xxx, 7, pp. 253–260, 3 graphs, 1946. [Mimeographed.]

Examination of considerable published data from Arkansas on the incidence of cotton *Fusarium* wilt [*F. vasinfectum*: cf. *R.A.M.*, xxi, p. 74] showed that in variety tests, on an average, for each increase of 5 per cent. in incidence (up to 60 per cent. infection) there was, approximately, a loss of 3 per cent. in seed cotton harvested. Fertilizer test data indicated that when both wilt and soil deficiency (primarily lack of potassium) were present, the reduction of yield was approximately twice that from wilt alone (up to 25 per cent. infection); at higher wilt percentages, most of the loss was attributable to wilt. It was found that plotting incidence on successive dates on semi-logarithmic paper shows up clearly the 'tempo' of wilt development with advance of the season. This 'tempo' appears to be a function of seasonal weather, unrelated to varietal disease reaction or soil treatment, but varying widely in character from one season to another.

MARCHIONATTO (J. B.). **Ensayos de laboratorio con el 'Fusarium vasinfectum'.** [Laboratory experiments with *Fusarium vasinfectum*.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, ii, 22, 7 pp., 2 col. pl., 1946. [English summary.]

Two strains of *Fusarium vasinfectum* isolated in 1937 and 1942 from wilted cotton plants of the Delta and Pineland 11A varieties [*R.A.M.*, xx, p. 235; xxi, p. 417], and one (dating from 1933) from Aleppo pine (*Pinus halepensis*), in Argentina, were inoculated into seedlings of the same species grown aseptically in Sachs's nutrient solution in culture tubes. The 1933 isolate was found to have lost its pathogenicity, that of 1937 was still capable of attacking the original host species (cotton), but not pine, and showed attenuation of virulence, while the 1942 isolate was highly aggressive, infecting both cotton and pine, the latter somewhat less severely.

SUBRAMANIAN (C. V.). **Some factors affecting the growth and survival of Fusarium vasinfectum Atk., the Cotton wilt pathogen in the soil, with special reference to microbiological antagonism.**—*J. Indian bot. Soc.*, xxv, 3, pp. 89–101, 1 pl., 1946.

Using a modification of Cholodny's technique [*R.A.M.*, xiii, p. 471], the writer conducted a series of experiments at the University Botanical Laboratory, Madras, to determine the capacity for persistence in sterilized and unsterilized local soils (sandy compost and sticky black) of two strains of *Fusarium vasinfectum*, the agent of cotton wilt. In the unsterilized soils the pathogen was invariably attacked and decomposed, usually within a month, by antagonistic species of the microflora, mostly bacteria, whereas in the sterilized it developed normally and produced numerous conidia, mainly of the micro type, as well as intercalary and terminal chlamydospores.

Of the soil amendments investigated in relation to the antagonism of soil micro-organisms to *F. vasinfectum*, 3 per cent. manure expedited the decomposition of the fungal mycelium and 1 per cent. monocalcium phosphate [superphosphate] retarded the process to some extent. In sterilized soil the manure treatment greatly stimulated the vegetative activity of the wilt fungus; monocalcium phosphate increased the production of chlamydospores and conidia.

DASTUR (R. H.) & AHAD (A.). **Studies in the periodic partial failures of the Punjab-American Cottons in the Punjab. XI. Trends in growth of normal and tirak plants with special studies on bolls.**—*Indian J. agric. Sci.*, xiv, 2, pp. 152–160, 9 graphs, 1944. [Received November, 1946.]

Evidence is adduced that boll growth on Punjab-American cotton plants affected by 'tirak' [*R.A.M.*, xxv, p. 498] did not follow normal trends, the arrest of development preceding the pathological condition. When seasonal factors are adverse during the fruiting stage boll growth is inhibited over an exceptionally wide area, resulting in crop failure, and the same applies to soils of medium or low salinity.

DUDDINGTON (C. L.). **Predacious fungi in Britain.**—*Trans. Brit. mycol. Soc.*, xxix, 3, p. 170, 1946.

The following first records of predacious fungi for Britain are reported [cf. *R.A.M.*, xix, p. 472]: *Cystopage lateralis, Protascus subuliformis, Stylopage* sp. [ibid., xxiv, p. 313], *Meria coniospora, Harposporium anguillulae* [ibid., xviii, p. 407], and *Dactylella bembicodes* [ibid., xxiv, p. 58], all from manure heaps and capturing nematodes except the *Stylopage* sp. which consumes small amoebae.

DRECHSLER (C.). **A species of Harposporium invading its nematode hosts from the stoma.**—*Bull. Torrey bot. Club*, lxxiii, 6, pp. 557–564, 13 figs., 1946.

A Hyphomycete found near Greeley, Colorado, destroying nematodes referable to *Rhabditis* sp. occurring on decaying barley straw, is described and named *Harposporium bysmatosporum* Drechsler n.sp.

KOEHLER (B.). **Hemp seed treatments in relation to different dosages and conditions of storage.**—*Phytopathology*, xxxvi, 11, pp. 937–942, 1 graph, 1946.

At the Illinois Agricultural Experiment Station seed lots of hemp were treated with arasan and new improved ceresan at the rates of $\frac{1}{2}$, 1, and 2 oz. per bush., and with spergon at $1\frac{1}{2}$ and 3 oz. [*R.A.M.*, xxvi, p. 15]. In 1943, grain moistures were held at 9·4 and 14·3 per cent. and storage temperatures at 32° and 70° F., the corresponding figures for 1944 being 7·6 and 10·1 per cent. and 70° and 90°, respectively. The storage periods in both years were one day, three months, and seven months.

The vitality of both treated and untreated seed deteriorated rapidly in storage

even at 32°. At this temperature the process was apparently not affected by differences in the moisture content, but under warmer conditions it was accelerated by increased moisture. All the disinfectants produced remarkable increases in stand, amounting to as much as 400 per cent. in seed of low vitality. The maximum rate of application of arasan and spergon gave better average results than the lower dosages without injury to the seed. New improved arasan, on the other hand, caused considerable damage when applied at 2 oz. per bush. to high-moisture seed stored for the longer periods at all the experimental temperatures. It should therefore be used at a dosage of 1 oz. per bush.

MASSEY (L. M.). **Blackspot can be controlled.**—*Amer. Rose Annu., 1946*, pp. 111–118, 1 col. pl., 6 figs., 1946.

A semi-popular account is given of the life-history and mode of infection of the rose black spot fungus, *Diplocarpon rosae*, followed by directions for its control by means of fermate [*R.A.M.*, xxiii, p. 64; cf. xxv, p. 402], used either as a spray ($1\frac{1}{2}$ lb. in 100 gals.) or dust (10 per cent.). This preparation requires an admixture of sulphur for the control of powdery mildew [*Sphaerotheca pannosa*], and the same adjunct may also improve its efficacy against black spot and rust [*Phragmidium mucronatum*: see next abstract]. Good results have been secured with a combination of $\frac{1}{2}$ lb. fermate and 3 to 4 lb. wettable sulphur per 100 gals. spray (or for smaller quantities 2 level teaspoonsful of the former and 2 tablespoonsful of the latter per gal.) and with 10 per cent. fermate and 90 per cent. sulphur dust. It is advisable to apply the fermate-sulphur mixtures early and late in the season, and the fermate spray alone, or 10 per cent. fermate and 90 per cent. talc dust, during the summer when temperatures exceed 90° F.

COCHRANE (V. W.). **The common leaf rust of cultivated Roses.**—*Amer. Rose Annu., 1946*, pp. 131–135, 1 col. pl., 1946.

This is a semi-popular account of the common leaf rust of roses (*Phragmidium mucronatum*) [*R.A.M.*, xxv, p. 451], with special reference to the environmental conditions governing its occurrence in different parts of the United States, illustrated by a comparison of weather records for San Diego, California, and Ithaca, New York. In the latter locality, and in the north-east generally, the disease is relatively innocuous owing to the unfavourable weather conditions, especially the long, cold winters, which destroy the uredospores; none of these organs withstood a period of over 70 days in outdoor exposure tests. The high summer temperatures act as a further bar to any extensive spread. At 75° F. uredospore germination and infection are noticeably lower than at 64° to 70°, and at 81° infection is virtually absent. At medium humidity the spores remain viable on the foliage for a year at 37°, seven weeks at 64°, and one week at 81°. In southern California, on the other hand, the temperature is uniformly favourable to the pathogen, and from October to April the rainfall is also adequate for the spread of infection. During the winter months, moreover, defoliation may be only partial, permitting the survival of the uredospores, which cause fresh infections with the resumption of active growth of the host: under such conditions the three-stage cycle is curtailed, the spring (aecidial) and autumn (teleuto) stages being eliminated. In the south-east, where the summer temperatures are even higher than in New York, the damage from *P. mucronatum* is negligible. Control may be effected by spraying or dusting with a mixture of fermate and sulphur [see preceding abstract].

CALDWELL (J.). **Mosaic disease of the Narcissus.**—*Nature, Lond.*, clviii, 4021, pp. 735–736, 1946.

The author, after reviewing briefly the progress of work on *Narcissus* mosaic [*R.A.M.*, xxii, p. 359; xxv, p. 162], records that further experimentation at Exeter

has confirmed the suggestion that spread is due to some vector on the foliage and that the disease is not seed-transmitted.

It has been found that the chlorotic symptoms may almost disappear from the leaves during the warm days of early summer; consequently great care is needed in the selection of healthy bulbs. It is almost certain that only one virus agent causes the different types of the disease, difference in symptom-expression being due to the variety. Juice from an affected Sir Watkin plant inoculated into Croesus induced symptoms typical of the latter variety. Inoculum from Croesus into a healthy Helios plant produced Helios symptoms, while back-inoculation from Helios to Sir Watkin induced typical Sir Watkin symptoms there. It is, therefore, important that suspected plants of all varieties should be rogued as soon as they are noticed, as they may infect other (and possibly much more susceptible) varieties. *N. jonquilla* and its hybrids and *N. poeticus* varieties appear to be little affected by the disease, whereas some of the *N. triandrus* hybrids appear to be highly susceptible; further, not one case of infection was found among thousands of wild *N. pseudo-narcissus* plants examined.

At present the best method of control consists in careful roguing, inspection beginning early in the growing season before the symptoms are masked by higher temperatures. In small plantings additional protection is afforded by insecticidal spraying. Seedling plants should be grown as far away as possible from diseased stocks.

SADLER (W. T.). **Iris leaf spot.**—*Iris Yearb., 1946*, pp. 101–103, 1946.

On the basis of his experience in east Devon since 1938, the writer recommends for the control of iris leaf spot (*Didymellina macrospora*) [*R.A.M.*, xxi, p. 81; xxii, p. 179] cutting down all spent stems except those carrying the required seed pods, from which only the foliage should be removed; cutting down the foliage fan-fashion (about 6 in. to top point of fan) in the autumn; and heavy applications of wood ash (2 lb. per sq. yd.) to the soil (50 per cent. deficient in potash locally) at the same time. The irises in the writer's garden near London were entirely free from leaf spot between 1906 and 1937, and reports from other parts of the country support his opinion that the fungus is inactive in an impure sooty atmosphere. Colloidal copper sprays were unsuccessful and an experimental dusting with soot was spoilt by rain.

ARK (P. A.) & BARRETT (J. T.). **A new bacterial leaf spot of greenhouse grown Gardenias.**—*Phytopathology*, xxxvi, 10, pp. 865–868, 1 fig., 1946.

The symptoms of a bacterial leaf spot causing heavy losses in gardenia plantings in central California resemble those described by Burkholder and Pirone from the eastern United States as due to *Phytomonas gardeniae* [*R.A.M.*, xx, p. 208]. Infection originates on the tender leaves in the form of minute dots which expand into a pale-yellow, later reddish-brown centre, with thickened, somewhat greasy margins, surrounded by a yellowish halo. Several spots may coalesce, and numerous infections tend to cause premature abscission. In exceptional cases the flower buds and sepals may also be involved. The high humidity and temperature maintained for forcing purposes provide ideal conditions for the spread of the disease by means of cuttings from infected plants, and especially by syringing to control red-spider mites, and for the subsequent development of epidemics.

The pathogenicity of the organism isolated from the exudate at the cut edges of diseased leaf tissues was established by inoculation and re-isolation tests in a greenhouse with day and night temperatures of 80° to 90° and 65° F., respectively. The first symptoms of infection appeared a week to nine days after the atomization of potted plants in moist chambers with suspensions of the bacterium in distilled water, and in a fortnight the spots had reached 1 mm. in diameter.

The organism is a rod measuring 1·6 to 2 by 0·3 to 0·5μ, motile by means of one or two unipolar flagella, Gram-negative, but staining with most of the aniline dyes; good growth is made in Cohn's, Uschinsky's, and the synthetic carbohydrate medium of the Society of American Bacteriologists; starch plate is completely digested in six days; indole and hydrogen sulphide are not produced; ammonia is formed in Hansen's peptone-glucose-dipotassium phosphate media (*J. Bact.*, xix, p. 223, 1930); nitrates are not reduced; skimmed milk is precipitated and litmus milk coagulated; gelatine is slowly liquefied. Arabinose, dextrose, fructose, galactose, lactose, maltose, mannitol, raffinose, sucrose, and xylose were utilized for the production of acid, but no gas was formed. The bacterium developed over a range from 10° to 37° C., with an optimum at 22° to 28° and a thermal death point of 50°. It differs strikingly in its yellow colonies (sulphine-yellow on potato dextrose-peptone agar) from *P. gardeniae*, with its dirty white growth and dark-brown discoloration of the medium, and is considered to be a new species, to which the name of *P. maculifolium-gardeniae* is assigned.

A reduction in the number of lesions was effected by spraying with a 1 in 2,000 copper sulphate solution plus a spreader of 0·1 per cent. triton B–1956 phthalic glyceryl alkyd resin, which should be applied at frequent intervals to prevent the accumulation of inoculum on old leaves. Fumigation should be substituted for syringing as a means of combating red spiders, since the latter practice definitely aggravates the leaf spot.

Ark (P. A.) & Tompkins (C. M.). **Bacterial leaf blight of Bird's Nest Fern.**—*Phytopathology*, xxxvi, 9, pp. 758–761, 1 fig., 1946.

Bird's nest fern (*Asplenium nidus*), which is widely grown under glass in the San Francisco Bay region of California, has been attacked recently by a destructive bacterial disease (apparently the first to be recorded on a fern) causing losses running into thousands of dollars in individual cases. The first symptoms are small, water-soaked, translucent spots, usually on the upper side of the frond, which rapidly expand under warm, humid conditions and cover the entire surface. The bacterium may also gain entrance to the plant through the water pores at the apex of the frond. Necrosis of one or more fronds spoils the symmetry of the plant and renders it unmarketable.

The causal organism was readily isolated from the diseased tissues on potato dextrose-peptone agar and inoculated into healthy ferns under conditions approximating to those prevailing in the affected nurseries. Re-isolations from the experimentally infected plants yielded strains which were identical with the original isolates and in turn gave positive results in inoculation tests. The bacterium, to which the name *Phytomonas asplenii* is assigned, is a Gram-negative rod, 1·2 to 2·4 by 0·3 to 0·5μ, motile by means of one to three polar flagella. On the abovementioned medium, the heavy, greyish-white, butyrous growth induces a gradual darkening of the substratum. Skimmed and litmus milk are not curdled. Indole is not formed in Dunham's solution, but ammonia is produced in P. A. Hansen's peptone-glucose-dipotassium phosphate media (*J. Bact.*, xix, pp. 223–229, 1930). Nitrates are not reduced to nitrites. Acid without gas is evolved in Fermi's solution supplemented by inverted Dunham fermentation tubes and in dextrose, sucrose, maltose, arabinose, xylose, glycerine, galactose, and fructose. Starch is not hydrolysed but gelatine is liquefied. The organism is a facultative anaerobe, developing at a temperature range of 1° to 34° C., with an optimum at 22° to 30° and a thermal death point of 50°.

Control measures comprise steam sterilization of the brick-dust and rat's-nest media (the latter a natural forest compost), flats, and pots, transplanting with sterile forceps, sparing use of water, and maintenance of a moderately dry atmosphere in the greenhouse.

GLASSCOCK (H. H.) & WARE (W. M.). **Uromyces striatus Schroet. on Medicago lupulina L. and other host plants in Britain.**—*Trans. Brit. mycol. Soc.*, xxix, 3, pp. 167–169, 1946.

A seven-acre field of trefoil (*Medicago lupulina*) near Faversham, Kent, examined on 17th October, 1945, was found to be infested by a rust similar to that described by Groves (The British Rust Fungi, p. 93, Cambridge, 1913) as the uredo and teleutospore stages of *Uromyces striatus*. The attack was virulent in large, pronounced patches, the leaves had been killed, and were covered by pustules. The fungus could not be found on an adjacent crop of lucerne, usually susceptible in the United States [*R.A.M.*, xxii, p. 209] and parts of Europe [ibid., xviii, p. 397]. Ogilvie and Munro reported an outbreak of this disease at Chedzoy, Somerset, in November, 1945.

A survey of the literature indicates that the only valid records of *U. striatus* in Britain are for *M. arabica*. In view of the fact that every British specimen of *U. striatus* on *Trifolium* spp. examined by the authors has proved to be *U. jaapianus*, all published records of *U. striatus* occurring on *Trifolium* will require confirmation. *U. striatus* is here recorded for the first time on a crop plant, *M. lupulina*, in Britain.

PALTI (J.). **Diseases of fodder crops and their control.**—*Hassadeh*, xxv, 7, pp. 240–242, 1 fig., 1945. [Hebrew.]

The most important foliar disease of Egyptian clover (*Trifolium alexandrinum*) in Palestine is caused by *Ascochyta trifolii* [*R.A.M.*, xxiv, pp. 193, 476], while a serious root rot is due to a widespread unidentified species of *Fusarium*. Of less frequent occurrence, but also potentially destructive, are *Rhizoctonia* [*Corticium*] *solani*, *Sclerotinia sclerotiorum*, and *S. trifolii* [? *S. trifoliorum*]. The *Fusarium* and *C. solani* root rots also affect lucerne, but usually only in a mild form.

Rust (*Uromyces fabae*) and chocolate spot (*Botrytis fabae*) are limiting factors in broad bean cultivation in Palestine [cf. ibid., xx, p. 442]. The first symptoms of chocolate spot and rust generally appear in early January and during February, respectively, so that October-sown crops are the most likely to escape infection. Copper spraying is effective against both diseases, but is economic only in cases where a single application will confer protection until the onset of dry weather in April precludes further material damage. The susceptibility of vetch to *U. fabae* renders it unsuitable as a near neighbour of broad beans.

A. fabae, an occasional parasite of the leaves, stalks, and pods, is seed-borne [ibid., xxiii, p. 167], and stringent precautions should be taken to eliminate contamination from this source. Field peas suffer from the same diseases as broad beans, with the exception of chocolate spot, but usually in a less severe form. Rust (*U. pisi*) and leaf spot (*A. pisi*) are moderately prevalent.

Maize and sunflower rusts (*Puccinia* spp. and *P. helianthi*, respectively) occur throughout the country, the latter being the only pathogen of importance on its host.

Cercospora beticola is common on beets, but seldom injurious to the fodder varieties. Crown gall (*Bacterium tumefaciens*) is also frequently observed, while *Urophlyctis pulposa* [ibid., xxii, p. 497] is occasionally found.

LEACH (J. G.) & RYAN (MARY A.). **The cytology of Ustilago striiformis forma poae-pratensis in artificial culture.**—*Phytopathology*, xxxvi, 10, pp. 876–886, 6 figs., 1946.

A cytological study at the West Virginia Agricultural Experimental Station of *Ustilago striiformis* from bluegrass (*Poa pratensis*) on potato dextrose agar [*R.A.M.*, xxv, p. 264] indicated that the smut is normally homothallic. It produced both a

haploid and diploid (syncaryotic) vegetative mycelium and has no true dicaryophase. The chlamydospore is occupied by a large, apparently diploid nucleus, which seems to undergo reduction division soon after spore germination. The germinating spore produces a branched germ-tube of indeterminate structure in place of a true promycelium. Sporidia do not develop and hyphal fusions were not observed. A partial reassortment of nuclei occurs in the branching germ-tube or resultant mycelium, followed by caryogamy without an intermediate dicaryophase. The syncaryotic cells multiply vegetatively, forming a characteristic fragmenting mycelium quite distinct from the radiating haploid form: each cell of the short fragments into which the former disintegrates contains a single large, apparently diploid nucleus, and may either be transformed directly into a chlamydospore or divide to produce new syncaryotic cells.

Blattný (C.) & Stary (B.). **Atlas of the injurious agencies affecting our fruit trees and shrubs. Second edition.**—375 pp., 130 col. pl., Plant Protection Institute of the Agricultural Experimental Stations in Prague, 1944. [Received December, 1946.]

In a brief foreword the authors state that the chief purpose of this work was to supply the local fruit-growers with a collection of photographs (or drawings in a few cases where photographs could not be taken), showing the most typical injuries caused to fruit trees and shrubs (including the vine, strawberry, and a few wild berries) in Czechoslovakia by various pathogenic agencies, such as environmental, atmospheric, and soil conditions, physiological factors, bacterial and fungal diseases, and insect and animal pests. These photographs are given in the 130 beautifully executed coloured plates appended at the end of the volume, and supplemented by brief descriptions in semi-popular language of the respective symptoms observed on the host plants. Besides indicating the control measures applicable in each separate case, a special chapter gives a full list of all the chemical preparations which have been tested and officially approved in Czechoslovakia for the control of the diseases and pests, including a wide range of proprietary compounds, indicating their composition and sources of supply.

Heiberg (Barbara C.) & Ramsey (G. B.). **Fungistatic action of diphenyl on some fruit and vegetable pathogens.**—*Phytopathology*, xxxvi, 10, pp. 887–891, 1946.

Of 52 pathogens of fruits and vegetables grown in pure culture on potato dextrose agar in the presence of vapour from diphenyl [*R.A.M.*, xxv, p. 112] crystals at dosages ranging from 1 to 20 mg. per plate, the most sensitive were *Aspergillus* spp. from nectarines, the colonies of which were barely perceptible after a week compared with 45 mm. diam. in the control series, *Botrytis allii* and *B. cinerea* (0 and 0 and 80 and 80, respectively), *Coryneum beijerinckii* [*Clasterosporium carpophilum*] (trace and 28), *Diplodia natalensis* (trace and 80), *Dothiorella* sp. from avocado (trace and 80), *Endoconidiophora* [*Ceratostomella*] *paradoxa* (trace and 80), *Macrophomina phaseoli* (trace and 80), *Melanconium* sp. from tomato (trace and 33), *Monilinia* [*Sclerotinia*] *fructicola* (0 and 55), *Pellicularia* [*Corticium*] *microsclerotia* [ibid., xxiv, p. 80] (trace and 70), *Penicillium digitatum*, *P. expansum*, and *P. italicum* (trace, 0, and trace and 63, 47, and 80), *Phoma* sp. from apple (6 and 76), *P. betae* (8 and 71), *P. destructiva* (10 and 57), *Phomopsis* [*Diaporthe*] *citri* (12 and 57), *P. vexans* (11 and 79), *Phyllosticta straminella* (8 and 72), *Pleospora lycopersici* (trace and 56), *Rhizoctonia* [*C.*] *solani* (8 and 80), *Rhizopus nigricans* [*R. stolonifer*: but see ibid., xxiii, p. 237] (trace and 80), *S. intermedia* (0 and 55), *Sclerotium rolfsii* (trace and 80), and *Septoria citri* (trace and 12). The action of the chemical, however, was merely fungistatic, arresting vegetative growth and preventing normal sporulation but not destroying the organisms.

The use of diphenyl-impregnated wraps may control decay in the commodities subject to infection by the above-mentioned common fungal rots, but in many cases the retention of the odour will preclude this application of the chemical.

The differential fungistatic action of diphenyl on many fungi can be utilized as a practical laboratory method for the decontamination of important pathogenic organisms.

DUNNE (T. C.). **'Wither tip' of Apple trees.**—*J. Dep. Agric. W. Aust.*, xxiii, 2, pp. 124–127, 5 figs., 1946.

Evidence of copper deficiency causing wither-tip or summer die-back of apple trees in West Australian orchards [*R.A.M.*, xvii, p. 534; cf. xxv, p. 505], aggravated by the limited supply of that element during the war years, led the author to review the benefits obtained by various copper treatments. Trees which, although unthrifty, did not show severe wither-tip symptoms also responded excellently to copper applications.

DUNNE (T. C.) & GULVIN (A. T.). **Manganese deficiency of Apple trees.**—*J. Dep. Agric. W. Aust.*, xxiii, 2, pp. 127–130, 4 figs., 1946.

A manganese Burgundy mixture consisting of 4 lb. manganese sulphate and 4 lb. sodium carbonate to 40 gals. water sprayed on to leaves of apple trees in West Australian orchards during November or early December successfully corrected manganese deficiency [*R.A.M.*, xxiii, p. 29; xxv, p. 120], which is usually severe in dry summers and where surface soils are light or very gravelly. Soil applications of manganese sulphate at the rate of 2 to 4 lb. per tree applied in August in a band 12 to 18 in. wide at the limit of the branches also gave satisfactory results, which did not, however, always become apparent in the succeeding season. Both methods of treatment are recommended for severe cases. It has been found that manganese deficiency exists in several districts in Western Australia and in some is increasing. At Kendenup it is widespread, and in the King and Kalgan River areas, at Mt. Baker, Denmark, Donnybrook, and in the hills east of Perth acute cases have been noted.

KIENHOLZ (J. R.) & CHILDS (L.). **Reduction in yield of the Anjou Pear caused by wettable-sulphur spray.**—*Phytopathology*, xxxvi, 9, pp. 777–779, 1946.

From 1942 to 1945, inclusive, a significant reduction in the yield of Anjou pears in the Hood River Valley, Oregon, has resulted from the application of a wettable sulphur spray (8 in 100) for scab (*Venturia pirina*) control [*R.A.M.*, xxv, p. 69]. For instance, in 1944, the percentage of blossoms setting their fruits after three treatments (pink, calyx, and first cover) with wettable sulphur was 1·9, compared with 3·4, 2·5, and 3·5, respectively, for the control trees and those sprayed with fermate (1·5 in 100), and copper phosphate-lime-bentonite (4–4–4–100), respectively. In 1945 the corresponding figures were 1·80, 2·84, 3·04, and 3·71, respectively. Since wettable sulphur is also ineffectual against scab and causes russeting, its application to Anjou pears should be discontinued locally in favour of copper phosphate or fermate, which improve the appearance of the fruit and foliage besides increasing production.

CATION (D.). **Stone fruits affected by 50 known virus diseases.**—*Amer. Fruit Gr.*, lxvii, 2, pp. 8–9, 20, 7 figs., 1946.

This is a popular note on the symptoms, diagnosis, and control of stone fruit virus diseases, among which the peach yellows, little peach [suspected to be a strain of the foregoing], red suture, and X-disease viruses, and the cherry yellows virus are selected as the principal representatives of the group in Michigan [*R.A.M.*, xxii, p. 142 *et passim*].

ZWIRN-HIRSCH (H. E.). **Infection experiments with aeciospores of Tranzschelia pruni-spinosae (Pers.) Diet. in Palestine.**—*Palest. J. Bot.*, J. Ser., iii, 3, pp. 178–179, 1945.

Tranzschelia [*Puccinia*] *pruni-spinosae* is widely distributed in its pycnidial and aecidial stages on the wild anemone, *Anemone coronaria*, and in its uredo and teleuto phases on almond, apricot, peach, plum, cherry, and other species of *Prunus* [*R.A.M.*, xv, p. 683; xxiii, p. 262]. In an attempt to establish a genetic connexion between the two stages, almond, apricot, and plum trees were inoculated with aecidiospores from *A. coronaria* leaves. Typical infections resulted on the two first-named after incubation periods of 51 and 18 days in February and May, respectively, compared with three months in Europe.

An examination of the Palestine herbarium specimens, all on cultivated *P.* spp., showed them to be of the forma *discolor*, whereas those from Rumania [ibid., viii, p. 17] were of f. *discolor* on apricot and of f. *typica* on wild *P.* spp. [ibid., xvii, p. 756]. The Palestine species is considered to be of the forma *discolor*.

The aecidia of the rust are very common on *A. coronaria* in Palestine, where their development slightly precedes the unfolding of foliage on the fruit trees; diseased leaves of the former, however, last much longer than sound ones and are still fresh when those of the fruit trees unfold. The mode of propagation of *P. pruni-spinosae* requires further study. The full life-cycle may well be completed in the hilly region of the country, where *A. coronaria* flourishes in the vicinity of orchards and the trees shed their foliage throughout the winter, while overseasoning uredospores may afford the chief source of new spring infections in the coastal plain, where a few leaves often remain on the trees.

SCARAMUZZI (NIA). **A mosaic disease of the Almond.**—*Int. Bull. Pl. Prot.*, xx, 9–10, pp. 77M–80M, 1946.

Groups of almond trees in the Province of Bari, Italy, were observed to show a leaf spot due to the presence of discoloured zones ranging from pale green to white. The spotting was irregularly distributed and was apparent in the central zone, at the base or extremity of the blade, and along the veins or margins. The lesions were at first punctiform, but later enlarged and showed a more marked discoloration. Folding and contraction of the leaves were also frequently observed. Towards the end of June many leaves turned completely yellow and fell, while the affected ones which did not fall reassumed a normal appearance. Towards September, however, the spotting again appeared. The most severely affected leaves were often noted on the outer rim of the foliage, so that in badly diseased trees the extremities appeared completely yellow. The Rachele, Scagliona, Mincaccetta, and Mandorla amara varieties appeared to be unaffected.

On a basis of the available evidence the author concluded that the condition was a form of mosaic due, probably, to a virus [cf. *R.A.M.*, xviii, p. 188]. Grafts from affected trees to peaches (in Bari) and almonds (at Rome) gave rise to characteristic symptoms.

DEMAREE (J. B.). **Rate of spread of Blueberry stunt in North Carolina.**—*Plant Dis. Reptr*, xxx, 9, pp. 321–325, 1 diag., 1946. [Mimeographed.]

The virus disease of blueberries (*Vaccinium australe*) known as stunt [*R.A.M.*, xxiii, p. 395; xxiv, p. 266; xxv, p. 330] spreads rapidly in North Carolina and New Jersey once it has become established, whereas such spread is either slow or lacking in Massachusetts, Michigan, and New York. It is possible that the rate of dissemination in the field may be determined by an insect vector. Circumstantial evidence suggests that first infections in new and isolated plantings arise from affected propagating material. Records of spread in a 10-acre blueberry field in

North Carolina showed that the percentage of infected plants increased in one block from 4·7 in 1942 to 47 in 1945.

Arango y Mestre (O.). **Insectos y enfermedades en el cultivo de la Fruta Bomba.** [Insects and diseases in Papaw cultivation.]—*Rev. Agric., Habana*, xxix, 1, pp. 77–80, 3 figs., 1946.

Brief notes are given on the symptoms and control of papaw bunchy top [*R.A.M.*, x, p. 398], *Pucciniopsis caricae, Oidium caricae* [ibid., xxiv, p. 51], *Gloeosporium* [? *papayae*], *Rhizopus*, *Rhizoctonia*, and *Cladosporium* spp., and *Mycosphaerella caricae* [ibid., xxi, p. 88], of which the first-named is the most important in Cuba.

Das Gupta (S. N.) & Sinha (S.). **Studies in the diseases of Mangifera indica Linn. IV. Investigations into the pathological histology of fruits affected with 'black-tip' disease with a note on the anatomy of the fruit.**—*Proc. nat. Acad. Sci., India* (formerly *Proc. Indian Acad. Sci.*), xiv, 3, pp. 102–108, 1 pl., 1944. [Received January, 1947.]

In this paper of the present series [*R.A.M.*, xviii, p. 329; xx, pp. 172, 313; xxv, pp. 127, 267] the authors describe the histological changes induced in mango fruits by necrosis or black-tip disease. The first symptom appears to be the deposition of a brown substance in the lumen of the vessels of the outer mesocarp at the distal end of the fruit. The brown discoloration spreads to the neighbouring parenchyma while the deposits also appear in the ducts. Browning and deposits gradually spread throughout the mesocarp, the affected cells disintegrating and coalescing into a dead tissue. In severe cases the necrosis extends to the endocarp. The epidermis breaks at certain points, and the break continues in the adjacent mesocarp; fissures form in the fruit, through which the brown substance oozes out, later hardening into a dry mass.

Roberts (J. W.). **Recent developments in fungicides. II. Spray materials—1936–1944.**—*Bot. Rev.*, xii, 9, pp. 538–547, 1946.

This review of the developments that took place between 1936 and 1944 in the improvement of the older standard fungicides and the evolution of new ones is designed to serve as a continuation of the author's earlier paper on the same subject [*R.A.M.* xvi, p. 332]. The present work deals with organic fungicides, derivatives of the dithiocarbamic acids, diphenylamines, chlorine derivatives of quinone and naphthoquinone, and certain other compounds. There is a bibliography of 65 titles.

Foister (C. E.). **The relation of weather to fungus diseases of plants. II.**—*Bot. Rev.*, xii, 9, pp. 548–591, 1946.

This review of the outstanding literature dealing with the correlation between weather and plant diseases is supplementary to the author's paper on the same subject published in 1935 [*R.A.M.*, xv, p. 383]. The subject is discussed under the main headings of predisposing factors, germination, disease initiation and epidemics, soil conditions and plant diseases, apparatus useful in aerobiology, and practical applications of the data obtained to methods of disease control. There is a bibliography of 267 titles, which, except in special cases, contains no references to papers published before 1935.

Vestal (E. F.). **Observations on economic plant disease fungi and weather at Allahabad, India, during the 1945–46 crop seasons.**—*Plant Dis. Reptr*, xxx, 8, pp. 284–298, 3 graphs, 1946. [Mimeographed.]

An account is given of the plant disease situation during 1945–6 in the vicinity of Allahabad, India, in relation to the prevailing weather conditions. Low tem-

perature and humidity from June to September, 1945, resulted in much-reduced activity of the leaf-spotting fungi (such as *Cercospora*, *Phyllosticta*, and *Colletotrichum*), whereas some species ordinarily saprophytic (*Choanephora cucurbitarum*) [*R.A.M.*, xix, p. 514] became abundant everywhere. Lowering of the temperature during October with a rise in humidity favoured root-rotting fungi. November to February, 1946, was marked by very low rainfall and this resulted in the late appearance of *Puccinia triticina* on wheats and *P. glumarum* and *P. graminis* on wheat and barley.

GARRETT (S. D.). **A multiple-point inoculating needle for agar plates.**—*Trans. Brit. mycol. Soc.*, xxix, 3, pp. 171–172, 1 diag., 1946.

A 10-point inoculating needle has been devised for the multiple inoculation of agar plates with agar mycelial disks. It consists of ten 15-cm. lengths of No. 20 gauge steel wire with one end of each hammered flat and each wire bent through an angle of 60° 6 cm. from the flattened end, and then at right angles in the reverse direction 10 cm. from the same end, both angles being in the plane of the flattened tip. The ten lengths are clamped to a grooved wooden holder. After sterilization of the points, the inoculum plate, in which agar disks have been cut with a sterile cork borer, is held upside down above eye-level, and an agar disk removed on one of the points. The instrument is then twisted slightly and a second disk removed on the next point, and so on. The inoculant plate is then held in a similar position, while the disks are transferred one by one to previously marked positions. Sixty-five plates were inoculated in four hours during the first trial of this technique, six plates developing a single contaminant colony, only two of which had to be discarded.

STEINHAUS (E. A.). **Insect microbiology. An account of the microbes associated with insects and ticks with special reference to the biologic relationship involved.**—x+763 pp., 244 figs., 6 diags., Ithaca, New York, Comstock Publishing Company, Inc., 1946. $7.75.

Included in this comprehensive work, described in the author's preface as an attempt to treat the various associations and relationships existing between all types of microbes and insects (including ticks and mites) from a biologic standpoint, and, in a sense, to serve as a compendium of the data concerned [cf. *R.A.M.*, xix, p. 593], are chapters on the specific bacteria associated with insects (III, pp. 38–187), yeasts and insects (VI, pp. 348–375), fungi and insects (VII, pp. 376–412), and viruses and insects (VIII, Sect. B, pp. 443–450). The bacteria and fungi are arranged systematically and their relationships with the insects concerned are described. The viruses are treated according to the mode and agent of transmission [cf. ibid., xx, p. 218]. A survey of the insects associated with willows [*Salix* spp.] revealed the frequent presence in the wood of larvae of the gall midge (*Rhabdophaga saliciperda*) and sawfly (*Euura atra*), which are strongly suspected as agents in the transmission of watermark disease, due to *Erwinia salicis* in England [ibid., xx, p. 432].

An 88-page bibliography and author and subject indices are appended.

SCRIBNER (B. W.) & ABRAMS (E.). **Effect of mildew on caselining material.**—*Paper Tr. J.*, cxxiii, 15, pp. 132, 134, 136, 138, 140, 1946.

At the request of the War Production Board, an investigation of the mildewing of case-lining materials under tropical conditions [cf. *R.A.M.*, xxv, p. 466 *et passim*] was undertaken at the National Bureau of Standards, Washington, D.C. Samples of sheetings for the lining of shipping cases, kraft paper used in their manufacture asphalt-laminated kraft papers, and liner seams sealed with various adhesives were hung in a room in which the temperature was maintained at 75°±1° F. for six

hours and at 85°±1° for the other 18 in each 24-hour period, and the relative humidity held at 95±2 per cent. during the first six and at 90±2 per cent. for the remaining 18 hours. The specimens were removed at the end of three or four successive four-week periods, examined for fungal infection, and tested for deterioration.

Mildew growth ranged from slight to heavy on the different samples, and the extent of disorganization was generally, though not consistently, correlated with the presence or absence of moulds, notably *Chaetomium globosum* and *Penicillium* sp. Other species observed were *Aspergillus niger*, *A. oryzae*, and *Actinomyces* sp. Papers reinforced with strands of sisal fibres or jute scrim cloth, and sheetings with cotton wadding or cotton cloth as a component, deteriorated much more rapidly than the other laminated samples. The maximum percentage decreases from the original tearing resistance, tensile strength, stretch, and water resistance of the asphalt-laminated papers were 70, 80, 70, and 90, respectively. The rate of deterioration of the asphalt-coated kraft papers was rapid and rose parallel with the melting-point of the asphalt fraction. In pure-culture tests the mildew growth was very heavy on the paper and very light on the asphalt. None of the adhesives, composed of asphalt, rubber, and synthetic resin mixtures, showed significant failure after the exposures.

SODERBERG (F. A.). **Mildewproofing of paper mill felts.**—*Paper Tr. J.*, Tech. Sect., cxxii, 25, pp. 281–282, 1946.

Dihydroxydichlorphenyl methane (preventol GD) [*R.A.M.*, xxiv, pp. 427, 428; xxv, p. 571], which was found to be of value during the war for the prevention of mildew on military equipment [ibid., xxv, p. 466 *et passim*], has now been applied with satisfactory results to papermakers' felts at the General Dyestuff Corporation, New York. By the suppression of the fungal and bacterial agents of mildew it extends the life of the felt (from 6 to 22 and 28 days in one trial), besides affording protection against moths. The application of the chemical is quite simple, consisting merely in the impregnation of the new felt by means of a dipper, spray pipe, or immersion, followed by a weak acid solution to precipitate the compound on the wool. The cost is less than $3 per 100 lb. felt.

[This information is also presented in *Pulp Pap.* (*Mag.*) *Can.*, xlvii, 13, pp. 88–89, 1946.]

BAARS (J. K.) & BOGTSTRA (J. F.). **Torulopsis utilis, de moderne voedingsgist.** [*Torulopsis utilis*, the modern food yeast.]—*Natuurwet. Tijdschr. Ned.-Ind.*, cii, 7, pp. 135–139, 1946. [English summary.]

An account is given of the production in Java, on a medium of cleared molasses and ammonium sulphate, of the food yeast, *Torulopsis utilis*, which was started on a small scale in December, 1941, and continued, subsequent to the Japanese invasion, in the European internment camps, where it was used in the treatment of various ailments and in the manufacture of bread. The work has now been resumed at Batavia for the primary purpose of developing a product utilizable as a complementary factor in the often very scanty native diet [cf. *R.A.M.*, xxiv, p. 7 *et passim*].

SPERBER (E.). **Studies in the metabolism of growing Torulopsis utilis under aerobic conditions.**—*Ark. Kemi, Min. Geol.*, xxi A, 3, pp. 1–136, 4 figs., 4 diags., 12 graphs, 1945.

This fully tabulated and documented account of the author's intensive studies at the Wenner-Gren Institute for Experimental Biology, Stockholm, on the growth of *Torulopsis utilis* [*R.A.M.*, xxiii, p. 399 and cf. preceding abstract] under aerobic conditions comprises, *inter alia*, a description of a new respirometer to measure

oxygen and carbon dioxide metabolism, an investigation of the composition of the yeast, notes on its growth with different nitrogen sources and on the turn-over of different carbon compounds by the organism, and particulars of respirometer experiments with growing *T. utilis*. A bibliography of 92 titles is appended.

WICKERHAM (L. J.), FLICKINGER (MAY H.), & BURTON (K. A.). **A modification of Henrici's vegetable-juice sporulation medium for yeasts.**—*J. Bact.*, lii, 5, pp. 611–612, 1946.

Satisfactory sporulation of *Hansenula*, *Zygohansenula*, *Pichia*, *Zygopichia*, *Saccharomyces*, *Zygosaccharomyces*, and *Debaryomyces* spp. has been obtained, after incubation periods ranging from within three days for the first four to as long as 20 for the last-named, on a medium consisting of the contents of a can (1 pint, 2 fl. oz.) of the mixed juice of eight vegetables (pH 6·8) with one-half of a cake of compressed yeast dispersed in it. The mixture is steamed for ten minutes, re-adjusted to pH 6·8, and added to an equal volume of hot distilled water containing 4 per cent. malted agar. The two solutions are mixed, bottled or tubed, and sterilized for 15 minutes at a pressure of 15 lb.

BRIAN (P. W.), CURTIS (P. J.), HEMMING (H. G.), & MCGOWAN (J. C.). **A substance causing abnormal development of fungal hyphae produced by Penicillium janczewskii Zal. I. Biological assay, production and isolation of 'curling factor'. II. Preliminary notes on the chemical and physical properties of curling.**—*Trans. Brit. mycol. Soc.*, xxix, 3, pp. 173–187, 2 figs., 1946.

During the investigations which showed that the toxicity of Wareham Heath soil [*R.A.M.*, xxiv, p. 332] was due almost entirely to antibiotic substances produced by *Penicillium janczewskii*, *P. jenseni*, and a group referable to the *P. nigricans-janczewskii* series of Thom [ibid., ix, p. 410], it was found that *P. jnaczewskii* produced an antibiotic distorting the germ-tubes of *Botrytis allii*. The preparation and properties of this substance are described. Known as 'curling factor', it is produced more abundantly in media containing nitrogen as nitrate than as ammonium salts or peptone. By chemical extraction 'curling factor' was obtained in pure form as colourless crystals.

Concentrations of 25 μgm. per ml. of 'curling factor' cause stunting of the conidial germ-tubes of *B. allii* and their early cessation of growth. Although concentrations of 100 μgm. per ml. did not inhibit germination, considerably lower concentrations (1 μgm.) caused the serious physiological effects described.

J. C. MCGOWAN adds a preliminary note on the purification and chemical and physical properties of 'curling factor'.

STONE (R. W.) & FARRELL (M. A.). **Synthetic media for penicillin production.**—*Science*, civ, 2706, pp. 445–446, 1946.

Formulae are given for synthetic media for the production of penicillin from surface and submerged growth, shake flask, stirred bottle, and tank cultures. The media are useful for research purposes owing to the greater ease with which the penicillin can be purified and to the greater sensitivity of response to chemical adjuvants. Growth is slower than with maize steep media, and the yields slightly lower.

COOK (R. P.) & BROWN (MARGARET B.). **Synthetic media for penicillin production.**—*Bio-chem. J.*, xl, 4, pp. xlix–l, 1946.

Applying the results obtained by the use of fractions prepared from aqueous extracts of ground dried or green peas, the writers have attempted to formulate a synthetic medium affording high penicillin yields [*R.A.M.*, xxv, p. 467]. Most of the experiments were carried out with surface cultures of *Penicillium notatum*

NRRL 1249 B21, but *P. notatum* NRRL 2000 (x1612) in submerged aerated culture was also used. The basal medium contains (as gm. per 100 ml.) sodium nitrate 0·3, potassium phosphate 0·05, crystalline magnesium sulphate 0·025, sodium chloride 1, and lactose 3, to which were added chemical compounds in quantities providing a total dry matter concentration in the medium corresponding to that secured from the use of the most active fraction.

The addition of individual amino acids alone exerted only a slight stimulus, but high penicillin yields were produced by the simultaneous addition of 1·5 per cent. glucose with leucine and tyrosine. Gelatine in amounts sufficient to give the equivalent of 140 mg. nitrogen per ml. medium provided a good source of mixed nitrogen-containing compounds. The addition of sugar alcohols, e.g., glycerol, gave yields of 160 mg. per ml.; monosaccharides in general were only slightly stimulatory, while of the di- and trisaccharides tested, 1·5 per cent. raffinose was the most effective. A further enhancement of the valuable properties of the gelatine-raffinose medium may be obtained by increasing the amounts of sodium chloride and lactose, 2 per cent. of the former and 4 per cent. of the latter, for instance, giving 300 units of penicillin per ml. in eight days.

Tobie (W. C.). **Aspergillin: a name misapplied to several different antibiotics.**—*Nature, Lond.*, clviii, 4020, p. 709, 1946.

The author considers it desirable to restrict the name 'aspergillin' to the black pigment of the spores of *Aspergillus niger*, thus designated by Linossier (*C. R. Acad. Sci., Paris,* cxii, pp. 489, 807, 1891; cli, p. 1075, 1910). This pigment, which has not been tested for antibiotic properties, has been repeatedly investigated and was described by Quilico (*Gazz. chim. ital.*, lxiii, p. 400, 1933) as a humic acid. Meanwhile, Bush and Goth, having applied the name 'aspergillin' to a compound of *A. flavus*, subsequently re-named it flavicin [*R.A.M.*, xxv, p. 227]; Stanley [ibid., xxiv, p. 111] applied 'aspergillin' to a crystalline compound from an unspecified strain of *Aspergillus*, but this is now [ibid., xxv, p. 514] considered to be similar to, if not identical with, gliotoxin; Soltys (*Nature, Lond.*, cliv, p. 550, 1944) referred to a filtrate from *A. fumigatus* as 'aspergillin' and Krasilnikov *et al.* [*R.A.M.*, xxv, p. 271] used it for an alcohol-soluble antibiotic produced from certain strains of *A. niger*. It is recommended that new names be selected for the antibiotics isolated by Soltys and Krasilnikov *et al.* if they prove to be new compounds.

Rao (R. R.), George (Mariam), & Pandalai (K. M.). **Pterygospermin: the antibacterial principle of Moringa pterygosperma, Gaertn.**—*Nature, Lond.*, clviii, 4021, pp. 745–746, 1946.

An antibiotic substance, which inhibited the growth of the acid-fast organism, *Mycobacterium phlei*, at a dilution of 1 in 30,000 and other organisms at from 1 in 30,000 to 1 in 75,000, has been named pterygospermin. The method of extraction from the root of *Moringa pterygosperma* [*M. oleifera*] is described.

Irving (G. W.), Fontaine (T. D.), & Doolittle (S. P.). **Partial antibiotic spectrum of tomatin, an antibiotic agent from the Tomato plant.**—*J. Bact.*, lii, 5, pp. 601–607, 2 figs., 1946.

Tomatin (previously designated 'lycopersicin'), an antibiotic agent occurring in Red Currant tomato (*Lycopersicon pimpinellifolium*) plants [*R.A.M.*, xxiv, p. 479], used at the rate of 5 units per ml., effectively inhibits the growth in pure culture of *Phytomonas* [*Xanthomonas*] *solanacearum, Fusarium oxysporum* [*F. bulbigenum*] f. [var.] *lycopersici, F. o.* f. *pisi* [*F. orthoceras* var. *pisi*], *F. o.* f. [var.] *conglutinans* [*F. conglutinans*], and other fungi.

Little (J. E.) & Grubaugh (K. K.). **Antibiotic activity of some crude plant juices.** —*J. Bact.*, lii, 5, pp. 587–591, 1946.

The crude, undiluted juices of a number of plants were tested for their activity against four human bacterial pathogens, seven phytopathogenic bacteria, and four species of *Fusarium* causing plant diseases.

The juice from a strain of Iowa Inbred maize resistant to bacterial wilt (*Bacillus* [*Corynebacterium*] *stewarti*) inhibited the growth of *C. stewarti* and *Erwinia carotovora* (inhibition zones of 18 and 10 mm., respectively); Wisconsin Jersey Queen cabbage (resistant to *F. oxysporum* f. *conglutinans*) [*F. conglutinans*] and wild mustard acted similarly on *Phytomonas* [*Pseudomonas*] *campestris* (10 mm.); and Ohio 31 cucumber (resistant to *E. tracheiphila*) on *E. carotovora* (10 mm.).

F. o. f. *niveum* [*F. bulbigenum* var. *niveum*] and *F. o.* f. *melonis* [*F. b.* var. *niveum* f. 2] both showed inhibition zones of 7 mm. in contact with wilt-resistant lines of Iowa Inbred maize; *F. conglutinans* and *F. o.* f. *lycopersici* [*F. b.* var. *lycopersici*] were similarly affected by Pan-American tomato (16 and 7 mm., respectively) and the Break o' Day variety (7 mm. in each case), both wilt-resistant; the latter also arrested the growth of *F. b.* var. *niveum* f. 2 (7 mm.), while the wilt-susceptible Bonny Best was antagonistic to *F. conglutinans* (16 mm.). On the other hand, all three tomato juices stimulated the development of *F. b.* var. *niveum* and those of the yellows-resistant Penn State Ballhead cabbage and cauliflower W.S. 300, resistant to *P. campestris*, promoted the growth of *F. o.* var. *conglutinans*.

Limasset (P.). **Recherches effectuées en Angleterre sur les maladies à virus de la Pomme de terre.** [The researches carried out in England on Potato virus diseases.]—*Ann. Épiphyt.*, N. S., xii, 1, pp. 45–55, 1946.

This is a French abstract of the discussion on potato virus diseases held at a joint meeting of the Association of Applied Biologists and the British Mycological Society in 1942 [*R.A.M.*, xxii, p. 367].

Ross (A. F.). **Studies on the cause of stem-end browning in Green Mountain Potatoes.**—*Phytopathology*, xxxvi, 11, pp. 925–936, 1946.

At the Maine Agricultural Experiment Station a Green Mountain potato strain from Minnesota normally resistant to stem-end browning [*R.A.M.*, xxv, p. 573] was rendered much more liable to the disease by tuber- and inarch-grafting with scions of the very susceptible Keswick strain. The enhanced predisposition to stem-end browning was manifest not only in the year of grafting, but also in the progeny of the tubers produced by the grafted plants or seed pieces. Transmission was not effected in all cases of organic union between the grafted plants, nor was it obtained by mechanical inoculation methods. The tubers of a Minnesota lot acquired a rather stronger tendency to stem-end browning during the first year or two of field, but not of cage, cultivation in Maine; otherwise there is no change from one year to the next in the relative incidence of the disease developing in the resistant and susceptible strains, the former group including Green Mountain strains from Vermont, Highmoor, and Phillips.

The available data are interpreted as indicative of the presence in the highly susceptible potato lots of a virulent virus strain absent from the resistant stocks, which harbour a milder form of the same entity.

Snyder (W. C.), Thomas (H. Earl), & Fairchild (S. J.). **Spindling or hair sprout of potato.**—*Phytopathology*, xxxvi, 11, pp. 897–904, 2 figs., 1946.

The artificial infestation of White Rose potato plants with psyllids (*Paratrioza cockerelli*) under controlled conditions in California showed that typical spindling or hair sprout [*R.A.M.*, xxv, p. 573] may be a symptom of psyllid yellows due to

the colonization by the insects of the parent plants when approaching maturity. The form of the disease under observation is not transmissible through the tubers, nor was there any evidence of virus implication in its etiology. The spindling sprouts show no tendency to recover as long as their growth is entirely sustained by the tuber, but once they have struck roots into the soil normal development ensues. The yield of spindling-sprout tubers was roughly half that obtained from normally sprouting seed, but the second generation from diseased tubers completely recovered and their production was not impaired. Severely affected tubers may form no sprouts. In one experiment in which spindling-sprout tubers were stored for several months internal browning was observed, resembling that reported by Sanford and Grimble from Canada in connexion with phloem necrosis [ibid., xxiv, p. 70].

The correlation thus established between spindling sprout and psyllid yellows emphasizes the importance of psyllid extermination measures, notably in areas of seed-potato production.

Opitz (K.). **Weitere Versuche über den durch Viruskrankheiten herbeigeführten Abbau der Kartoffel.** [Further experiments on the Potato degeneration induced by virus diseases.]—*Pflanzenbau*, xvi, 9, pp. 323–342, 6 graphs, 1940. [Received January, 1947.]

The writer's series of parallel experiments on potato degeneration at Berlin-Dahlem and Bornim [*R.A.M.*, xvi, p. 828] were continued over the three-year period from 1937 to 1939 and resulted in the following grouping of the eight varieties tested: (1) fairly resistant, Ackersegen, Jubel, and Daber; (2) less resistant, Industrie, Robinia, Estimata, and Priska; and (3) least resistant, Weltwunder. The reactions of Robinia, Estimata, and Priska to the virus diseases responsible for degeneration fluctuated from year to year, and were particularly anomalous in the last-named, the yields of the first- to third-year progeny of which were scarcely inferior to those of the original stock despite fairly heavy infection.

As in previous years, healthy plants immediately adjacent to diseased ones developed specially severe symptoms, and in some cases an almost direct correlation could be established between the state of health of the progeny and the removal in the previous year of the infection focus to a distance of 5 to 6 m. Such incidental observations as were made on the influence of the wind direction on virus spread [cf. ibid., xxv, p. 311] pointed to a favourable effect on health of a site south of the infection focus. The prevailing west winds were not generally more conducive to virus dissemination than those from other quarters.

Late planting did not promote freedom from the viruses, streak [virus Y] in particular being conveyed to the young plants by the wingless aphids (*Myzus persicae*) active in July and causing heavy infection. Preliminary experiments in the control of the insect vectors by spraying the plants four or eight times during the growing period with nikotin, nikopren, or parasitol II gave encouraging results.

Roberts (F. M.). **Underground spread of Potato virus X.**—*Nature, Lond.*, clviii, 4019, p. 663, 1946.

During field experiments at Rothamsted Experimental Station it has been observed that potato tubers from plants adjacent to those infected by potato virus X were sometimes infected, although the haulms had not reacted when tested for the presence of this virus at the end of the season. While one explanation of this was that infection had occurred through the foliage late in the season and that the virus passed to the tubers without becoming systemically established in the haulms, it seemed no less probable that spread might have occurred underground.

After various experiments using healthy and infected tubers planted in the same pot with cellophane screens erected to prevent foliage contact in one of these there was a suggestion of spread without leaf contact [cf. *R.A.M.*, xvii, p. 832]. Tests on the haulms at the end of the season were negative in both the screened and unscreened pots, but the harvested tubers showed that spread had occurred in one of the screened pots.

Similar experiments with tomato, which is much more susceptible than potato to infection by virus X, and in which spread is much more rapid, showed that spread occurs equally well whether there is root contact only, or both root and leaf contact between infected and healthy plants. Pairs of healthy plants were used and when 5 to 6 in. high one was inoculated with the virus. Tests made eight weeks later showed that seven of nine uninoculated plants in the unscreened pots had become affected and five of nine in the screened. In a further experiment, employing a screen providing a continuous barrier between the infected and healthy shoots, the virus spread to all nine uninoculated plants (root contact only) and to seven of nine unscreened. All the control tomato plants in the same greenhouse, not in contact with infected plants, remained healthy. No evidence was obtained as to how the underground spread took place.

REESTMAN (A. J.). **De beteekenis van de virusziekten van de Aardappel naar aanleiding van proeven met gekeurd en ongekeurd potgoed.** [The importance of the Potato virus diseases in connexion with experiments on certified and uncertified seed.]—*Tijdschr. PlZiekt.*, lii, 4, pp. 97–118, 1 pl., 4 graphs, 1946. [English summary.]

A tabulated survey is given of four years' comparative investigations (1940–43) in Holland to determine the effects of virus diseases, especially leaf roll, on the yield of certified and uncertified 'seed' of some well-known commercial potato varieties. In general, the losses caused by potato virus X were less severe than those due to leaf roll, while leaf roll and virus X together or crinkle [virus X+ virus A] resulted in heavier reductions than leaf roll alone. Healthy plants with leaf roll-diseased neighbours produced larger yields than those with virus-free neighbours, and it was demonstrated graphically that the yield per plot of healthy plants increased *pari passu* with the number of plants affected by leaf roll.

In 1941 the differences in yield between healthy plants and diseased plants in a 50 per cent. leaf roll-diseased crop ranged from 35 to 51 per cent., and in 1942 from 33 to 63 per cent. of the yields of healthy plants. The Ultimus variety sustained much heavier damage than Triumph. However, taking healthy and diseased plants together, the reduction in yield in a crop with 50 per cent. leaf roll ranged from 11 to 19 per cent. in 1941 and from 6 to 24 per cent. in 1942. To a large extent, therefore, the loss was compensated by the increased yield of the healthy plants in the crop, generally amounting to between 5 and 7 per cent.

The average weight of the tubers rose with the yield, the increases being particularly marked in the light-cropping varieties. In 1941 the dry weight of the tubers from leaf roll plants was higher than that of sound ones in most varieties, but in 1942 the relative positions were reversed. There was no difference in this respect in 1943, but after grading the dry weight of small tubers from diseased plants was found to be higher than that of those healthy ones of the same size, whereas in large tubers the opposite was the case [cf. *R.A.M.*, xxiv, p. 245]. These observations apply to the tubers of plants with secondary infection. In the case of primarily diseased tubers the dry matter content is probably lower than that of healthy ones, judging by a planting test in which considerably more leaf roll developed in plants arising from tubers with a low dry matter content than from those with a high one.

CLINCH (PHYLLIS E. M.). **Observations on a severe strain of Potato virus X.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxiii, 28, pp. 273–299, 3 pl., 1944.

A severe disease, first observed by the author in 1934 in a single potato plant of a small crop of British Queen potatoes grown from certified seed in Co. Dublin, and subsequently detected in seed-potato stocks and in the field, was shown by inoculation experiments in 1938 to be caused by virus X only. The symptoms, which are considered, therefore, to be due to a virulent strain of virus X, are described in 32 potato varieties, in all of which, except three reacting by top necrosis only, a primary stage of leaf necrosis and defoliation is succeeded in the same year by severe mosaic and stunting. The virulence of the disease abated strikingly and regularly in all varieties during the third year of infection in the one clone. This is considered to be due to mutation of the virulent strain to a mild. Reasons are given for not accepting the hypothesis that the attenuation is due to sorting out of the mild strain from a mixture of the two. No evidence of such a mixture in either potato or tobacco could be obtained, and the symptoms in potato plants inoculated with the two strains were different from those infected by the severe strain only. There was, moreover, nothing to show that the mild strain multiplied or moved through its hosts more rapidly than the severe one, which was, on the contrary, highly infectious and became systemic in the potato and other hosts with a rapidity at least equal to, if not greater than, that of mild X [*R.A.M.*, xviii, p. 130; cf. xxii, p. 269].

Solanaceous hosts shown by inoculation to be susceptible were *Datura stramonium*, *Nicotiana glutinosa*, tomato, *Solanum nodiflorum*, *S. nigrum*, chilli, and White Burley and Orinoco tobacco.

Of a large number of non-solanaceous hosts tested by inoculation only *Lamium hybridum* reacted systemically; local lesions were induced in *Veronica agrestis*, beetroot, and mangold.

The physical properties and serological reactions of the severe strain are similar to those of other X strains; plants harbouring a mild strain could not be infected with the severe strain by sap inoculation, but were by grafting.

The U.S.D.A. Seedling 41956 was immune from infection with the severe strain, which passed freely downwards through intermediate scions of this variety in double-grafted plants over 2½ months old. Upward movement in plants of the same age and older was inhibited by the presence of the immune variety. The author considers that movement of the virus in potato stems is of two types, one passive and the other dependent on multiplication. The former is closely bound up with that of elaborated food materials (as in the case of tobacco mosaic) and the main path of rapid movement is downwards in the phloem. The multiplicative type of movement takes place in an upward direction, irrespective of the age of the plants, and probably traverses the parenchymatous tissues. It was not possible to demonstrate the presence of virus X in the intermediate scions of Seedling 41956.

Transmission of virus X to Majestic plants grown in contact with diseased plants was obtained, although on an average only 3 out of 11 tubers carried infection in 1940 and 7 out of 15 in 1941. None of the Majestic plants which were near, but not in contact, contracted the virus. The intolerant varieties Arran Crest and Epicure did not become infected even when grown in contact with diseased plants. Symptoms of the disease could rarely be detected in the Majestic plants in the current year of infection; moreover, the foliage was virus-free. It is thought that the virus passed from the contact leaves to the tubers in the food stream without spreading to the rest of the plant. The production of some healthy sprouts from infected tubers is explained on the supposition that the amount of virus reaching the tubers was small and that there was little or no multiplication there.

This severe strain of virus X resembles closely Salaman's X strain [ibid., xviii, p. 130] in its symptoms in several potato varieties (although in certain others it differed) and in other solanaceous hosts, and in its physical properties. Moreover, Salaman's observation that a more or less complete clinical recovery occurred ultimately in a clone when the stock was carried on by tuber in the greenhouse, in which case only X^G (a mild strain) could be found, indicates a further similarity. Severe X differs, however, from X^N in being more readily communicable by grafting than by sap inoculation, in that leaf drop is predominantly a first-year symptom, and infected tubers invariably give rise to diseased plants, sprouting not being affected.

WHITE (N. H.). **Potato tuber rots.**—*Tasm. J. Agric.*, xvii, 2, pp. 235–241, 5 figs., 1946.

Brief, popular notes are given on the symptoms and control of the following tuber rots of potato found in Tasmania: pink rot, caused by *Phytophthora erythroseptica* and other *P.* spp. [*R.A.M.*, xix, p. 40], dry rot (*Fusarium caeruleum*) [ibid., xxiv, pp. 201, 384], watery wound rot, black wound rot, or leak (*Pythium ultimum*) [ibid., xx, p. 488], late blight (*Phytophthora infestans*), early blight (*Alternaria solani*), charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*: ibid., xxiii, p. 187], jelly end rot due to environmental conditions, and secondary rots, chiefly due to *Bacterium carotovorum* [*Erwinia carotovora*].

In Tasmania, pink rot is most common in warm autumn weather, especially if the soil has been rather moist before the tubers were dug. Dry rot is probably the most frequent of the potato rots locally; it does not attack the potatoes while they are still in the ground, but is essentially a storage disease. It is most active in winter and spring, especially in early varieties. In the last few years there have been several instances of tuber rot due to *A. solani* locally. Blackleg (*Bacterium phytophthorum*) [*Erwinia phytophthora*] and bacterial ring rot (*Corynebacterium sepedonicum*) have not yet been recorded in Tasmania.

Late blight of Potatoes.—*J. Dep. Agric. Vict.*, xliv, 6, pp. 269–271, 2 figs., 1946.

Potato late blight (*Phytophthora infestans*) was first recorded in Victoria in 1909, and in 1910–11 it was responsible for an epidemic which destroyed 75 per cent. of the crop. Since that date the outbreaks of the disease have been few and mild, and 25 years' experience at the Department of Agriculture has shown that annual protective spraying against the pathogen is not an economic practice, except in isolated areas where environmental conditions may favour more frequent attacks. A brief, popular description is given of the symptoms and course of the disease, with directions for control along the usual lines.

Brown rot of Potatoes.—*Agric. Gaz. N.S.W.*, lvii, 10, pp. 541–542, 1 fig., 1946.

A note is given in popular terms on the symptoms and mode of infection potato brown rot (*Bacterium* [*Xanthomonas*] *solanacearum*), which is prevalent in the coastal districts, particularly in the north of New South Wales [*R.A.M.*, xix, p. 69]. In addition to the use of disease-free tubers and crop rotation with non-solanaceous plants, the cultivation of the resistant Katahdin variety is advocated and brief directions are given for treatment of the soil with sulphur on the lines found effective in Florida [ibid., xviii, p. 788].

NIEDERHAUSER (J. S.). **Sclerotinia sclerotiorum on Potatoes on Long Island.**—*Plant Dis. Reptr*, xxx, 8, p. 270, 1946. [Mimeographed.]

On 26th June, 1946, *Sclerotinia sclerotiorum* was found in two adjacent potato fields on the South Fork of Long Island, its occurrence so far north being unusual

in the United States. About 4 per cent. of the plants were affected, and the chief symptom was a general wilt of the whole plant or of a single stalk in a hill. The stem was attacked at about soil-level and a wound probably provided the infection court. No apothecia were found, but it is assumed that they were the source of infection.

Garrett (S. D.). **A study of violet root rot. Factors affecting production and growth of mycelial strands in Helicobasidium purpureum Pat.**—*Trans. Brit. mycol. Soc.*, xxix, 3, pp. 114–127, 2 pl., 1946.

The maximum growth of mycelial strands on potato tubers (King Edward or Majestic), inoculated with 8·5 mm. disks cut from a growing colony of *Helicobasidium purpureum* [*R.A.M.*, viii, p. 527] on meat-malt extract agar and buried in glass jars filled with soil, was measured after about seven weeks by a paper scale fitted over the curved surface of the tuber.

With increasing storage age of the tuber the distance covered by mycelial strands and the frequency of infection cushions decreased. The smaller production and growth of strands from disks of inoculum cut from the growing margin of the culture than from those cut within a circle 8·5 mm. from the margin is considered to be due to the lesser mycelial density in the former.

Increasing concentration of nutrients in the agar, particularly that of malt, encouraged the production and growth of strands. The capacity of the inoculum disks from shallow cultures to produce strands declined with increasing age of colony after five to six weeks at 25° C., but not when double-depth agar (6 mm.) was used. Strand growth from disks from colonies transferred after three or four weeks' growth at 25° to a laboratory temperature of 15 to 20° for a further week or two was less than from those kept at 25° throughout.

Strand growth was greater in a soil–sand mixture (1 to 3) than in soil, and in the latter medium it was further reduced at medium and low, but not at high, soil-moisture content by soil acidity, the same reduction taking place in mycelial growth over Rossi–Cholodny slides [ibid., xv, p. 527].

Rose (D. H.). **Handling and shipping early Potatoes.**—*Circ. U.S. Dep. Agric.* 744, 44 pp., 20 figs., 1 graph, 1946.

Included in the section of this paper dealing with damage to early potatoes from mishandling in the field and packing-house is an account of the relation of heat injury to bacterial soft rot (*Erwinia carotovora*) [*R.A.M.*, xxiv, p. 115], sometimes preceded by a darkening of the exposed side of the tuber and the leakage of juice at the lenticels. Temperatures approaching 90° F. are the most conducive to the development of the rot, which may occur, however, in a serious form in unrefrigerated consignments moved to market when the average temperature of the load does not exceed 70°. Both field and laboratory tests (the latter carried out with infra-red lamps) showed that bacterial soft rot is a sequel to injury from heat, as distinct from light, rays. In the case of freshly dug potatoes the only condition generally requisite for heat injury was that the flesh just below the skin on the exposed side should reach a temperature of 110° or upwards and there remain for at least 30 minutes. This degree of heat in the tuber corresponds to an air (shade) temperature of 90°, at or above which potatoes should not be lifted unless they can be transferred to shelter within 15 to 30 minutes.

Chilton (S. J. P.) & Tullis (E. C.). **A new race of Cercospora oryzae on Rice.**—*Phytopathology*, xxxvi, 11, pp. 950–952, 1946.

A new race of *Cercospora oryzae* [*R.A.M.*, xxvi, p. 80], designated race 6, is reported on rice in Louisiana and Texas. It attacks Rexoro and other commercial

varieties of Rexoro parentage, e.g., Bluebonnet and Texas Patna, as well as a selection known as Nirex. The differential varieties Blue Rose, Blue Rose 41, Caloro, and Fortuna are all resistant to the new race, and a similar reaction was shown by the commercial Acadia, Arkansas Fortuna, Arkrose, Asahi, Calady 40, Cody, Colusa, Delrex, Early Prolific, Hill Medium, Kamrose, Lady Wright, Magnolia, Nira, Nira 43, Prelude, and Zenith.

RAYCHAUDHURI (S. P.). **Mode of infection of Rice by Ustilaginoidea virens (Cke.) Tak.**—*J. Indian bot. Soc.*, xxv, 3, pp. 145–150, 1 pl., 1946.

Two different types of rice infection by *Ustilaginoidea virens* [*R.A.M.*, xx, p. 149; xxiv, p. 471; xxv, p. 139] were observed at the Central Experiment Station, Dacca, Bengal, one marked by the presence on the panicle of a few sclerotioid structures in place of grains and mostly empty glumes, and the other by a paucity of sclerotia, most of the glumes being normally filled although the hairs are sometimes infected by the greenish-brown spores of the smut. A thorough examination of the empty glumes of the first type showed that infection of the inflorescences takes place at a rudimentary stage in their development. The androecium and gynoecium were found buried inside the central core of the pseudoparenchymatous tissue of the smut ball. The anther walls were intact and the pollen grains preserved within, denoting the failure of fertilization and consequent absence of grain formation. Microtome sections of the smut ball showed disintegration of the ovary.

In the early stages of the second type of infection dense spore clusters were discernible along the two lines constituted by the interlocking palea margins, which are soon forced apart by the germinating spores; ultimately a wide passage is formed and they enter in large numbers, coming into contact with the pericarp. The epidermal and mesocarp cells were found to be the most susceptible to infection, undergoing disorganization at a very early stage. The cross cells are the next to be invaded, while the tube cells of the inner epidermis are still intact. As soon as the mycelium reaches the endosperm its growth is strongly accelerated, and eventually it replaces the entire grain. The spore ball continues to swell and the gap between the two paleae widens, so that yet more spores gain ingress. A green velvety mass is rapidly formed and the spores produced by the mycelium are extruded.

U. virens has been reported by Butler and Bisby [ibid., xi, p. 545] from Tinnevelly, Assam, Samalkota, and Madras, and it is also known to occur in Bombay, Bihar, and Orissa. Of the 16 rice diseases recorded by Wei in China [ibid., xiii, p. 652], false smut is listed as sixth in descending order of importance.

WALLACE (T.). **Mineral deficiencies of plants.**—*J. Inst. Brew.*, N.S., xliii, 4, pp. 181–187, 1946.

This lecture, read and discussed at a meeting of the Midland Counties Section of the Institute of Brewing on 21st March, 1946, embodies the results of the author's studies on mineral deficiencies of plants which have been noticed from time to time in this *Review*.

MALAN (C. E.). **Cystidiella valdensis, nuovo genere e nuova specie di Blastomiceti anascosporei.** [*Cystidiella valdensis*, a new genus and a new species of anascosporous Blastomycetes.]—*Mycopathologia*, iii, 3–4, pp. 255–261, 3 pl., 1943. [German summary.]

The author describes a new genus of the anascosporous Blastomycetes with articulations in the form of a cystidium, which he names *Cystidiella*. The new genus belongs to the Torulopsidaceae, and is near *Trichosporon*. The type species, *C. valdensis*, was found in the soil of a rye field in Piedmont.

ZOGG (H.). **Die Blattdürre des Mohns.** [Poppy leaf blight.]—*Verh. Schweiz naturf. Ges.* cxxv, p. 172, 1945.

Pyrenophora [*Pleospora*] *calvescens* is the agent of a destructive opium poppy (*Papaver somniferum*) blight [*R.A.M.*, xxiii, p. 120] in the Zürich district of Switzerland, affecting the plant at all stages of its growth. Thus, the seedlings sustain heavy damage from damping-off, while girdling of the roots of older plants leads to collapse, spots develop on the stems and capsules, the leaves shrivel, and so forth. The writer's studies bore mainly on the reactions of the host to foliar infection, which consisted in (1) an increase in latex production, signalized by the appearance of milky drops on the under side of the leaf; (2) blue staining of the invaded areas, notably the leaf veins; and (3) a gummous line of demarcation (anti-toxic immune reaction) between the healthy and infected tissues. Of these responses only the third is specific, representing an attempt by the host to repel the fungal toxins, which succeeds only at temperatures above or below the optimum of 24° to 28° C. Under these conditions the infectious principle is localized but not eliminated.

WIEHE (P. O.). **Report on a visit to Trinidad, Louisiana and other countries.**—*Publ. Dep. Agric. Mauritius* 28, 119 pp., 14 pl., 1 fig., 8 diags., 5 graphs, 3 maps, 1946.

Matters of phytopathological interest are the subject of parts II, III, and IV of this report, dealing, respectively, with new sugar-cane varieties, originating at the British West Indies Central Breeding Station, Barbados, and recently introduced into Mauritius; plant protection and quarantine; and sugar-cane diseases, comprising comparative observations on the position in Louisiana and Mauritius in respect of red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*], mosaic, and chlorotic streak.

STEVENSON (G. C.). **Sugarcane varieties produced by the Sugarcane Research Station, and their value to the sugar industry of Mauritius.**—*Bull. Mauritius Sugarcane Res. Sta.* 18, 24 pp., 4 pl. (2 col.), 1946.

Of the sugar-cane varieties released for planting by the Mauritius Sugarcane Research Station, M.171/30 sometimes germinates poorly owing to pineapple disease (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) of the cuttings, necessitating extensive replacements to fill the resultant gaps in the stand. The pathogen is amenable to control by immersion of the cuttings before planting in a fungicidal solution such as Bordeaux mixture [cf. *R.A.M.*, xxv, p. 524]. M.171/30 is also fairly susceptible to smut (*Ustilago scitaminea*), especially during periods of drought.

The performance of M.73/31 has often been exceptionally promising in the absence of red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*], to which it is highly susceptible. The search for a satisfactory method of testing resistance to this disease of new varieties, discontinued during the war, is expected to be resumed shortly.

Susceptibility to red rot is also a great disadvantage of the otherwise successful M.134/32; the several types of reaction of this variety to *P. tucumanensis* have been described elsewhere by the author [ibid., xxv, p. 234].

M.112/34 is highly resistant to gumming disease [*Xanthomonas vasculorum*], but susceptible to a red spotting of the leaf sheaths caused by *Cercospora vaginae*. The symptoms induced by this quite innocuous fungus are liable to confusion with those of red rot, to which M.112/34 is resistant, and this may have delayed the propagation of this valuable cane. M.112/34 was once found infected by chlorotic streak in the cold, high-rainfall area of Savanne, and should not be grown where such conditions prevail.

CUNNINGHAM (G. H.). **Gasteromycetes of Australia and New Zealand.**—xv+236 pp., 37 pl., 1 fig., 1 diag., Dunedin, J. McIndoe, 1944. [Received October, 1946.]

This treatise, embodying the results of the author's intensive study, over a 20-year period, of the Gasteromycetes of Australia and New Zealand, aims at providing as complete a record as possible of the genera and species of the areas covered. The book comprises sections on the economic importance, spore dispersal, cytology, types of development, phylogeny, distribution, classification, and taxonomy of the group, a glossary, and a nine-page bibliography.

STEVENSON (J. A.). **Fungi novi denominati. II.**—*Mycologia*, xxxviii, 5, pp. 524–533, 1946.

The author gives technical descriptions of 12 further fungi [cf. *R.A.M.*, xxiii, p. 191], hitherto undescribed. *Physoderma paspali* n.sp. causes chocolate-brown, later ashen, spots on living leaves of *Paspalum plicatulum* in Puerto Rico. In advanced stages the spots are often overgrown by *Colletotrichum graminicola*. Bitancourt reported *Physoderma* sp. on *Paspalum millegrana* in Brazil (*Int. Bull. Pl. Prot.*, xii, p. 52M, 1938), but without descriptive notes. Other species on grasses, such as *Physoderma zeae-maydis* [*P. maydis*: *R.A.M.*, xxiv, p. 207] and *P. gerhardti* differ from *P. paspali* (the golden-brown, smooth sporangia of which measure 18 to 33 by 15 to 24μ) in their smaller sporangia and other distinctive characters.

Entyloma trigonellae n.sp., found on living leaves of *Trigonella foenum-graecum* in California, is characterized by amphigenous, circular to oval, light yellow sori 1 to 2 mm. in diameter, sometimes showing a greenish halo when dry, with spherical to subspherical, rarely ovoid, hyaline to yellowish spores 12 to 16μ in diameter, rarely 12 to 18 by 14 to 15μ, the wall being 1·5 to 2μ thick. The spores often show evidence of a gelatinous envelope which may form papillae on the spore wall.

Asterina (*Englerulaster*) *phoradendricola* n.sp. was found on living leaves of *Phoradendron flavescens* parasitic on pecan and various other hosts in Florida. *Chaetoseptoria wellmanii* n.sp., causing spots on living bean (*Phaseolus vulgaris*) and cowpea leaves in El Salvador, shows 3 to 10 scattered, immersed, later partially erumpent, amphigenous, membranous pycnidia per spot, measuring 120 to 170μ in diameter, with a definite, circular ostiole 15 to 25μ in diameter, with straight, erect 3- to 6-septate setae 5 to 6μ in diameter and 90 to 225μ long; and hyaline, acicular, straight or variously curved conidia, obtuse to truncate at one end and long-acute at the other, sparingly and indistinctly septate, and measuring 75 to 160 by 2·5 to 4μ.

Ovularia lupinicola n.sp. was found on living leaves of lupins in Washington and Colorado. *Septonema agaves* n.sp., found on living leaves of *Agave americana* in El Salvador, has smooth, light brown, branching, septate conidiophores up to 30μ long by 3 to 4μ in diameter; the conidia are 1- to 9-septate, shortly catenulate, verrucose, deep brown, not constricted at the septa, straight to slightly curved, cylindrical with rounded ends, and measure 15 to 45 by 5 to 6μ.

Cercospora lonchocarpi n.sp. is widespread on living leaves of *Lonchocarpus nicou* in Brazil and Peru, *L. urucu* in Brazil, and *L. chrysophyllus* in British Guiana. This leaf spot inducing fungus appears to be common wherever the host genus is grown in northern South America. It causes considerable defoliation at times, and may possibly become of economic importance.

OLIVE (L. S.). **Some taxonomic notes on the higher fungi.**—*Mycologia*, xxxviii, 5, 534–547, 4 figs., 1946.

These taxonomic notes on fungi collected by the author in the United States include an account of *Melanospora interna* [*R.A.M.*, ix, p. 62] apparently parasitic

on a *Fusarium* causing pod rot of groundnuts [cf. E. W. Mason, Annotated Account of Fungi Received at the Imperial Mycological Institute, List 11. Fasc. 2, p. 36, 1933].

CHAVES BATISTA (A.). **Estudos fitopatológicos.** [Phytopathological studies.]—*Bol. Agric., Pernambuco*, xiii, 2, pp. 51–60, 18 figs., 1946. [English summary.]

The following records are based on material collected in Bahia, Brazil. *Diplodina dianthi* n.sp. was isolated from carnations affected by foliar and stem blight, sometimes causing the death of the plants. The pathogen thrives at a temperature of 28° to 33° C. Its immersed, later erumpent, spherical to globose, carbonaceous, black pycnidia measure 160μ in diameter and are provided with a papillate ostiole, and the hyaline, elliptical, uniseptate conidia, 12 by 4μ, are borne on simple, hyaline, acicular conidiophores.

Another new parasite of carnations is *Amphichaeta diffusa* n.sp., which produces diffuse, circular, sunken, brown lesions, later darkening to black, on the foliage and stems, and is also responsible for post-emergence damping-off under warm, humid conditions. It is characterized by a stromatoid layer giving rise to immersed or erumpent black acervuli containing conidiophores on which are borne cylindrical, multiseptate conidia, with one part dark and the other hyaline, 16 by 6μ, with two cilia, each 6μ in length. Spraying with 1 per cent. Bordeaux mixture gives good control.

Cashew nuts (*Anacardium occidentale*) are attacked by *Dendryphiella cruzalmensis* n.sp., which induces the formation on the leaves of irregular brown spots, not exceeding 5 mm. in diameter. Shrivelling and defoliation ensue, but the damage to the plant is unimportant. The fungus produces intra- and intercellular hyphae and conidiophores with nodules or cyathiform appendages; the elliptical, multiseptate, dark, acro- and pleurogenous conidia measure 22 by 8μ. In potato dextrose agar cultures sporulation occurs after 48 to 60 hours; the profusely branched, dark, long, sterile hyphae are 4μ in diameter; chlamydospores were not observed.

Ascochyta sacchari n.sp. was isolated from Coimbatore sugar-cane plants bearing on the leaves elliptical, chlorotic, purple-bordered spots, 12 to 15 by 3 to 5 mm. It produces amphigenous, glabrous, circular, dark chestnut-coloured, immersed, later erumpent, ostiolate pycnidia, 96μ in diameter, and uniseptate, elliptical or cylindrical, hyaline conidia, 8 to 10 by 2 to 3μ.

Phyllosticta marantae n.sp. forms on the leaves of arrowroot *Maranta arundinacea* light brown, later confluent lesions involving large areas of the surface and resulting in desiccation and a consequent heavy reduction in the output of rhizomes. The immersed, later erumpent, globose, ostiolate, black pycnidia measure 108 by 100μ, and the oval conidia, less than 2μ in diameter, are produced in abundance; conidiophores are quasi-obsolete.

White-Pine blister rust quarantine (quarantine No. 63).—*U.S.D.A., B.E.P.Q.*, 4 pp., 1946.

A revision of the white pine blister rust (*Cronartium ribicola*) quarantine [*R.A.M.*, xviii, p. 80] reduces the areas of the United States in which the inter-State movement of five-leaved pines is regulated, provides for unrestricted inter-State movement of gooseberry and currant plants, except European black currants, into all parts of the country outside the control areas (containing five-leaved pine stands which are being safeguarded from infection by the pathogen), as designated in administrative instructions by the Chief of the Bureau of Entomology and Plant Quarantine; and abrogates the clause requiring the transport of gooseberry and currant plants in a dormant or defoliated condition, or their disinfection prior to dispatch to certain States.

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VIÉGAS (A. P.) & TEIXEIRA (C. G.). **Alguns fungos de Minas Gerais.** [Some fungi of Minas Gerais.]—*Rodriguésia*, ix, 19, pp. 49–56, 6 pl., 1945. (Issued 1946.)

Among the 19 specimens of fungi from Minas Gerais, Brazil, submitted for examination in February, 1945, were *Cercospora sesami* on sesame [*R.A.M.*, xxiv, pp. 219, 388] and *Phyllachora tupi* n.nom. causing a leaf spot of *Oplismenus hirtellus* [*O. compositus*]. According to the information at the author's disposal the latter species is identical with *Montagnella* (?)*puiggarii* Speg., but as that specific epithet has already been applied by Theissen and Sydow to another member of the genus on a leguminous plant (*Ann. mycol., Berl.*, xiii, p. 512, 1915), the parasite of *O. compositus* is renamed *P. tupi* with the additional synonyms *P. graminis* (Pers.) Fuck. [*R.A.M.*, xxiv, p. 251] var. *tupi* f. *oplismeni* Speg. and *Phragmocarpella puiggarii* (Speg.) Theiss. & Syd.

The list also includes *Clavaria parasitica* parasitic on a species of *Catacauma* [? *Phyllachora*] on living leaves of Myrtaceae.

VIÉGAS (A. P.). **Alguns fungos do Brasil. VII–VIII. Cyphellaceae e Thelephoraceae.** [Some fungi of Brazil. VII–VIII. Fungi Imperfecti (Sphaeropsidales).]—*Bragantia, S. Paulo*, v, 4, pp. 253–290, 16 pl., 1945.

The following records are selected from this further instalment [cf. *R.A.M.*, xxv, p. 234; xxvi, p. 81] of the author's critical studies on Brazilian fungi: *Corticium salmonicolor* on Pear oranges, *Exobasidium vaccinii* on *Rhododendron viscosum* [ibid., xxiii, p. 346]; *Pellicularia filamentosa* [*C. solani*: ibid., xxii, p. 372] on *Asplenium* sp., bitter orange, *Datura stramonium*, Virginia, Kentucky, Turkish, and Chinese tobacco, *Nicotiana rustica*, *N. glutinosa*, *N. silvestris*, *Solanum nigrum*, potato, *Nicandra physaloides*, *Bidens pilosa*, bean (*Phaseolus vulgaris*), *Eleusine indica*, hybrids of *Ananas* sp., and *Hybanthus atropurpureus* [*Ionidium atropurpureum*]; and *Pellicularia* [*C.*] *koleroga* [ibid., xxii, p. 372] on pear and peach (previously reported by Noack on apple and quince in *Bol. Inst. agron. S. Paulo*, ix, pp. 75–88, 1898).

VIÉGAS (A. P.). **Alguns fungos do Brasil. XI. Fungi Imperfecti (Sphaeropsidales).** [Some fungi of Brazil. XI. Fungi Imperfecti (Sphaeropsidales).]—*Bragantia, S. Paulo*, v, 12, pp. 717–779, 25 pl., 3 figs., 1945.

This further instalment of the author's critical study of Brazilian fungi [see preceding abstract] comprises 22 new species, including *Aschersonia caapi* parasitizing coccids on the foliage of Gramineae, *Phyllosticta guajavae* on guava, and *Rhabdospora bambusae* on *Bambusa pallescens*. The pulvinate, ashen, pruinose, isolated or conglobate stromata of *A. caapi* are 1 to 2·5 mm. in diameter. The immersed, irregular pycnidia measure 240 to 300 μ in diameter. The hyaline, subulate, branched conidiophores bear hyaline, fusoid, biguttulate, smooth conidia, 8 to 11 by 2·5 to 3 μ.

The lesions produced by *P. guajavae* on the under sides of the leaves are brick-red, delimited from the healthy tissues by a purplish-black zone, while those on the upper sides are paler and more diffuse. The spots attain a length of several

centimetres. The depressed, mostly triangular, subepidermal, ostiolate, black pycnidia measure 90 to 120 μ in diameter and 50 to 60 μ in height. The hyaline, acicular, simple conidiophores, 8 to 10 μ in length, bear hyaline, smooth, ellipsoid, biguttulate conidia, 5 to 7 by 2 μ.

R. bambusae is characterized by numerous globose to depressed, subepidermal, indistinctly ostiolate, black pycnidia, 300 to 400 μ in diameter and 100 to 200 μ [to 120 μ in Portuguese text] in height, with carbonaceous walls 20 to 28 μ thick. The cylindrical, straight or curved, smooth, septate, fuscous conidia, 36 to 48 by 2·5 to 3 μ, are borne on hyaline conidiophores, 20 by 2·5 to 3 μ.

Among the other records may be mentioned *Aschersonia aleyrodis* parasitizing Aleyrodidae [*R.A.M.*, xv, p. 216] on orange and cassava; *A. andropogonis* and *A. basicystis* on Aleyrodidae infecting *Myrciaria jaboticaba* leaves; *A. goldiana* on Aleyrodidae on orange; *A. turbinata* on Aleyrodidae and unspecified insects on guava, and on undetermined insects on *Citrus* sp., and *A. blumenaviensis*, *A. crenulata*, and *A. cubensis* on Aleyrodidae on unidentified hosts; *Ascochyta citri* on orange, mandarin orange, and lime [ibid., xxi, p. 324]; *Cicinnobolus cesatii* hyperparasitic on *Oidium anacardii* on *Anacardium occidentale* and *O.* sp. on *Hibiscus esculentus* [cf. ibid., xxiv, p. 476]; *Cytospora sacchari* on sugar-cane; *C. salicis* on *Salix* spp. (first record for Brazil); *Darluca filum* [ibid., xxi, pp. 472, 493; xxiv, p. 476] hyperparasitic on *Uredo* sp. on *Panicum maximum* and on *Puccinia levis* on *Tricholaena rosea*; *Diplodia macrospora* and *D. zeae* on maize [ibid., xxiv, p. 363]; *D. natalensis* on *Aleurites fordii*, groundnut [ibid., xxiv, p. 189], papaw, orange, cotton, sweet potato, cassava, *Manihot glaziovii*, mulberry [loc. cit.], and bean (*Phaseolus vulgaris*) seed; *D. tubericola* [ibid., xviii, p. 788] and *Phyllosticta batatas* [ibid., xxiii, p. 428] on sweet potato; *Macrophomina phaseoli* on bean; *Phomopsis* [*Diaporthe*] *citri* on orange, tangerine, and grapefruit; *Septoria callistephi* on *Callistephus chinensis* and *Aster* sp. [ibid., x, p. 734]; *S. dianthi* on carnation [ibid., x, p. 297; xxi, p. 324; xxiii, p. 409; xxiv, p. 475]; *S. lactucae* on lettuce [ibid., xxiv, p. 135]; *S. loefgreni* Noack on orange; *S. petroselini* on parsley [ibid., xxiv, pp. 158, 476]; and *Physalospora* (*Sphaeropsis*) *malorum Peck* [*P. obtusa*: ibid., xiii, p. 312] on apple.

Rayss (T.). **Nouvelle contribution à l'étude de la mycoflora de Palestine (troisième partie).** [A new contribution to the study of the mycoflora of Palestine (third part).]—*Palest. J. Bot.*, J. Ser., iii, 3, pp. 151–166, 4 figs., 4 graphs, 1945.

This further instalment of the author's critically annotated studies on the mycoflora of Palestine [*R.A.M.*, xx, p. 495; cf. also xxii, p. 497] comprises 40 species (two Archimycetes and 38 other Phycomycetes), of which 31 are mentioned for the first time in the present series. The list, which brings the total number of Palestine fungi investigated by the author to 422, includes three new species and one new form.

Reference may be made to the following items. *Pseudoperonospora cubensis* develops during the height of summer on cucumber leaves in the coastal plain, the exceptional lateness of its appearance, in comparison with other downy mildews, being probably correlated with the heavy local falls of dew.

Peronospora matthiolae Gaeum. occurs on *Matthiola incana*, *P. aestivalis* [*P. trifoliorum*] on lucerne [ibid., xxii, p. 112; xxv, p. 455], *P. meliloti* [*P. trifoliorum*] on *Melilotus indicus* [loc. cit.], *P. arthuri* on *Clarkia elegans* [ibid., xxv, p. 342], *P. antirrhini* on *Antirrhinum orontium* [ibid., xxv, p. 454], and *Bremia lactucae* on *Carthamus tenuis*, *Crepis aspera*, *C. bulbosa*, *Picris galilaea*, and *Lagoseris* [*Pterotheca*] *bifida*. Nine species of *Mucor* were isolated from soil samples.

Maire (R.). **Études mycologiques. Fascicule 5.** [Mycological studies. Part 5.]—*Bull. Soc. Hist. nat. Afr. N.*, xxxvi, 1–7, pp. 24–42, 9 figs., 1945.

In this further contribution to his series of mycological studies [cf. *R.A.M.*, x, p. 692], the author gives descriptive notes of 20 new and little-known species of

fungi found by him in Europe and North Africa, including *Phyllosticta fulvomaculans* n.sp. on orange leaves in Algeria, *Phomopsis algerica* n.sp. on mandarin twigs in Algeria, and *Ascochyta boehmeriae* n.sp. on leaves of *Boehmeria nivea* at Algiers, all three being parasitic.

PETRAK (F.). **Über die Gattung Geminispora Pat.** [On the genus *Geminispora* Pat.] —*Ann. mycol., Berl.*, xlii, 1–2, pp. 72–74, 1944. [Received December, 1946.]

Evidence is adduced, from examination of material collected by Sydow in Ecuador, in support of the inseparability of *Geminispora* Pat. from *Phyllachora*. Hence, the former should be regarded as a synonym of the latter and the type species, *G. mimosae*, a parasite of *Mimosa floribunda* in Ecuador, renamed *P. mimosae* (Pat.) Petr.

PETRAK (F.). **Fungi.** *Ex* RECHINGER (K. H.) et al. **Ergebnisse einer botanischen Reise nach der Iran, 1937.** [Fungi. Results of a botanical expedition to Iran, 1937.]—*Ann. natur. Mus. (Hofmus.) Wien*, 1, pp. 414–521, 10 figs., 1940. [Received December, 1946.]

Among the fungi found on material collected on an expedition through Persia [cf. *R.A.M.*, xxi, p. 99] in 1937 were *Gymnosporangium clavariiforme* [ibid., xx, p. 330] on *Cotoneaster nummularia* [*C. racemiflora*] and *G. confusum* on medlar [ibid., xxiv, p. 376] in the provinces of Khorasan and Mazanderan, respectively. This critically annotated list comprises four new genera, 38 new species, three new varieties, and one new combination.

PETRAK (F.). **Fungi.** *Ex* RECHINGER (K. H.) et al. **Neue Beiträge zur Flora von Kreta.** [Fungi. New contributions to the flora of Crete.]—*Denkschr. Akad. Wiss. Wien*, cv, 2, pp. 9–26, 1943. [Received December, 1946.]

The fungi found on material collected by K. H. RECHINGER in Crete during a botanical expedition from April to July, 1942, included, besides one new genus and 16 new species, *Graphiola phoenicis* on date palms [*R.A.M.*, xvii, p. 504], *Puccinia graminis* on *Berberis cretica*, *P. scolymi* on *Scolymus hispanicus*, *Ustilago cynodontis* on *Cynodon dactylon*, *U. hordei* on barley, and *Septoria apii* on celery.

PETRAK (F.). **Über einige Arten der Gattung Phyllosticta.** [On some species of the genus *Phyllosticta*.]—*Ann. mycol., Berl.*, xlii, 1–2, pp. 81–87, 1944. [Received December, 1946.]

Evidence is presented for the identification of the fungus described by Wenzel as *Phyllosticta angulata*, the agent of an apple leaf spot in Austria [*R.A.M.*, xv, p. 814] with *P. lantanae* Pass., 1882, collected by the author in 1917 in south-east Galicia on leaves of apple, elm, *Viburnum lantana*, and *Prunus serotina*. Another synonym is *Phyllosticta translucens* Bub. & Kab. (*Ann. mycol., Berl.*, xiii, p. 109, 1915).

DRECHSLER (C.). **Zoospore development from oospores of Pythium ultimum and Pythium debaryanum and its relation to rootlet-tip discoloration.**—*Plant Dis. Reptr*, xxx, 7, pp. 226–227, 1946. [Mimeographed.]

Oospores of *Pythium ultimum* from maize meal agar plate cultures three months old produced zoospores within 18 hours after transfer to a shallow layer of water in Petri dishes maintained at 10° C. An evacuation tube, usually 3 to 6 μ wide beyond the frequently broadened base, was pushed through the oogonial wall and grew to a total length of 10 to 40 μ, when it formed a papilla through which the protoplasmic contents soon migrated into a vesicle where, usually, eight to ten zoospores were formed. When encysted they measured mostly 8 to 10 (rarely up to 13) μ in diameter and germinated by the emission of one or two hyphae, usually 2 to 3 μ wide, but they also often show repetitional emergence. At 25° the spores

germinated by hyphae even without the addition of fresh water, after removal to a glass slide.

Zoospore formation has not before been recorded for *P. ultimum*. The activity of this fungus and of *P. debaryanum* in causing damping-off is not apparently related to the development of zoospores, since the fungus easily spreads by means of the growth of the mycelium in the soil, but the frequent occurrence of *P. ultimum* as the cause of blackening of root tips, particularly under cool, wet conditions, does suggest zoospore infection. It would appear likely that under natural conditions zoospore production from the germination of after-ripened oospores may occur more abundantly than from the mycelial sporangia.

Addition of partly decayed leaf mould to maize meal agar plate cultures after the substratum had been well permeated by the fungus often resulted in a pronounced increase in oospore formation. The same treatment that induced oospore germination in *P. ultimum* was also successful with *P. debaryanum*, using oospores from maize meal agar plate cultures two months old. In prolonged wet periods, *P. debaryanum*, like *P. ultimum*, can often be isolated in quantity from blackened root tips of crop plants.

DRECHSLER (C.). **Several species of Pythium peculiar in their sexual development.**—*Phytopathology*, xxxvi, 10, pp. 781–864, 29 figs., 1946.

Supplementary discussions and illustrations are given of *Pythium oligandrum* and *P. salpingophorum*, originally described by the author in 1930 [*R.A.M.*, x, p. 211]; earlier accounts of *P. anandrum* [ibid., xviii, p. 651; cf. also xxiii, p. 359; xxiv, p. 188] and *P. periplocum* [ibid., xviii, p. 650] are amplified, and comparative observations are made on the morphology and development of the congeneric species *P. vexans* [ibid., xix, p. 283; xxi, p. 344; xxii, pp. 305, 319; xxiv, p. 275] and *P. undulatum* Petersen sensu Dissmann (*Arch. Protistenk.*, lx, pp. 142–192, 1927).

P. oligandrum is a common occupant not only of damped-off seedlings, but also of decaying stems and roots of older plants in widely separated localities of the United States, among its hosts being peas, beans (*Phaseolus vulgaris*), sweet potato, tomato, sugar beet, sweet peas, and wheat. The species probably occurs as a secondary invader in the majority of cases, but it was encountered once, unaccompanied by any other likely pathogen, in a cucumber fruit affected by watery decay in the field near Beltsville, Maryland, and inoculations through incisions on the same host and watermelon gave positive results. The zoosporangia of *Pythium oligandrum* generally resemble those of *P. acanthicum* [*R.A.M.*, xviii, p. 650]. The subspherical, spiny oogonium is usually delimited proximally by a massive plug and distally by a cross wall; it often includes a cylindrical prolongation at one or both ends and may occasionally be entirely cylindrical. Parthenogenetical development is very common; where one or two antheridia are present, they usually arise from a single branch. The mycelial connexion between the male and female organs is seldom traceable; where it can be discerned, its total length may range from 250 (occasionally only 125) to 600 μ. At maturity the oospore usually contains 4 to 15 refringent bodies embedded in the granular parietal layer surrounding the single reserve globule. After a six months' resting period it germinates on shallow irrigation, often giving rise to zoospores by the discharge of its undifferentiated contents into a vesicle through an evacuation tube 10 to 50 μ long. The germination process in *P. periplocum* is similar, the germ-hypha, after reaching a length of 50 to 200 μ, frequently serving as an evacuation tube for the passage of the granular contents into a vesicle where they are converted into zoospores.

In the case of *P. vexans*, of which *P. complectens* [ibid., iv, p. 286] is regarded as a synonym, the oogonium and antheridium are united at a very early stage, and during their subsequent expansion their outward shapes may undergo considerable

modification in the area of contact, notably where a hard agar medium offers resistance to their growth. In water or soft agar, however, the oogonium largely retains its original form, while the antheridium frequently develops into a structure consisting of two to four elongate-digitate or more broadly lobate parts which clasp the oogonium. The antheridium is borne at the tip of a branch arising either from the oogonial or an adjacent hypha. The oospores germinate freely in water, often producing zoospores. The protoplast produces either a germ-hypha serving as an evacuation tube or a zoosporangium sessile on the oogonial sheath or terminal on a germ-hypha. *P. vexans* has been isolated from the root systems of peas, sweet potato, pansy, tomato, chilli, beans, sugar beet, celery, spinach, and other plants. Oospores of *P. anandrum* from three-month-old cultures usually give rise to zoospores on germination.

When *P. salpingophorum*, *P. vexans*, *P. undulatum*, and *P. anandrum* are grown on an agar medium in opposition to *P. oligandrum*, *P. periplocum*, or *P. acanthicum*, their mycelial advance is arrested through the envelopment and invasion of the hyphae by branches from the antagonist. Similar injuries are sustained by the above-mentioned four species cultured in opposition to *Aphanomyces cladogamus* [ibid., xxii, pp. 114, 373] or *Plectospira myriandra* [loc. cit.]. Conversely, the hyphae of *Pythium periplocum* may suffer damage from the appressoria of *P. vexans*.

NEWHALL (A. G.). **More on the name Ansatospora acerina.**—*Phytopathology*, xxxvi, 10, pp. 893–896, 1946.

It is pointed out that Neergaard's name of *Centrospora ohlsenii* takes precedence over the author's *Ansatospora macrospora* [*R.A.M.*, xxv, p. 343] and the new combination *A. acerina* (Hartig) of Hansen and Tompkins [ibid., xxiv, p. 305]. However, Neergaard had evidently missed Hartig's paper [loc. cit.], assigning the name of *Cercospora acerina* to the pathogen of *Acer pseudoplatanus* seedlings. Priority and the rules of nomenclature dictate the retention of the earliest specific name, and the fungus should therefore be known in future as *Centrospora acerina* (Hartig) n.comb., the synonyms including *Sporidesmium acerinum* (Hart.) Frank, *Cercosporella acerina* (Hart.) Arnaud, *Cercospora macrospora* Ostw., *C. cari* Westend. & Van Luijk, and *C. praegrandis* Sprague.

The last-named, the agent of a leaf spot of *Osmorhiza brevipes* in Oregon, is of interest as an additional record of the pathogen on a new host generically related to *Petroselinum*, *Carum*, and *Apium*, on which it has already been described. The rejection of the name *Ansatospora* in favour of *Centrospora* entails the substitution of *C. bromi* (Sprague) [n.comb.] for *A. bromi* on *Bromus rigidus* [ibid., xxv, p. 345].

The evidence supplied by Rader [ibid., xxiv, p. 487], Truscott [ibid., xxiv, p. 174], and others supports Hartig's opinion that *C. acerina* is capable of a saprophytic existence in the soil. It is a low-temperature pathogen with a fairly wide host range, unlike the leaf-spotting members of the genus *Cercospora*. With these attributes *Centrospora acerina* might assume a serious character but for the exacting requirements of the conidia and their rather brief period of viability. The fungus appears to be most troublesome under the humidity and temperature conditions associated with a maritime climate.

PRINCE (A. E.). **The biology of Gymnosporangium nidus-avis Thaxter.**—*Farlowia*, ii, 4, pp. 475–525, 2 pl., 2 graphs, 1 map, 1946.

These exhaustive studies of the taxonomy, distribution, and symptomatology of the heteroecious cedar-apple rust fungus, *Gymnosporangium nidus-avis* [*R.A.M.*, xiii, p. 780] have enabled the author to determine *G. juvescens* to be synonymous with it on the basis of the almost identical size and morphology of their periphyses and spermatia, the size and simultaneous appearance of the spermogonia, and the

absence of any difference in the morphology and size of the sori or in the aecidiospore and teleutospore dimensions. Crowell's view [ibid., xx, p. 23] that *G. effusum* is synonymous with *G. nidus-avis* is rejected on the ground of morphological distinction of the telial phases (as shown by examination of type material from the Arthur herbarium) and difference in host ranges.

The hosts of the telial phase of *G. nidus-avis* show a nearly continuous and sometimes overlapping distribution in southern Canada and the United States, and it is believed that this rust will be found in every State and Province within the range of the telial hosts. Local distribution may be limited by the relative times of maturation of the teleutospores and foliar development of the aecidial host, the viability of the spores, and the physiography of the area. The existence of resistant *Juniperus* hosts, which can be confirmed at any time by field observations, also constitutes a limiting factor. Evidence from culture studies of the existence of resistant strains of the pomaceous or *Juniperus* hosts or both is given.

As a result of extensive inoculation experiments guidance can now be given as to which pomaceous trees can be grown near susceptible juniper species. The following additions to the extensive host list of this rust were made as a result of these experiments: *Amelanchier amabilis*, *A. asiatica* var. *sinica*, *A. bartramiana* × *A. laevis*, *A. florida*, *A. grandiflora* f. *rubescens*, *A. oblongifolia* var. *micropetala*, *A. sanguinea*, *A. sera*, *A. spicata*, *Amelasorbus jackii*, *Chaenomeles lagenaria* [*Cydonia japonica*], *Chaenomeles superba*, *Sorbaronia dippelii*, *Sorbus americana* and varieties *fructo-* its *alba* and *micrantha*, *S. aria* var. *salicifolia*, *S. aucuparia* and its varieties *edulis* and *xanthocarpa*, *S. discolor*, *S. japonica* var. *callocarpa*, *S. latifolia*, *S. scopulina*, and *S. thuringiaca*. All plants inoculated and found susceptible to one or more of the six strains used are listed in appendix I, and the 74 species and varieties found to be immune in appendix II.

Compared with other cedar-apple rusts, *G. nidus-avis* has little economic importance, requiring exceptionally favourable conditions in order to establish infection. Removal of the broom and the affected parts near its point of attachment is inferior as a control measure to the prevention of infection by not planting susceptible alternate hosts nearer than 300 ft. and to the practices recommended by MacLachlan and Crowell [ibid., xvi, p. 618].

QUANJER (H. M.). **'Premunity.'**—*Phytopathology*, xxxvi, 10, p. 892, 1946.

The term 'acquired immunity' has been used by Price [*R.A.M.*, xii, p. 120] and others to denote the condition of plants exhibiting no reaction to a further inoculation with a given virus once they have contracted infection with it or with a closely related virus or strain.

In human and animal pathology the term 'immunity' or 'acquired immunity' is used in a different sense, denoting the condition existing in organisms which have overcome and expelled a certain pathogen, and remain non-susceptible to it or a nearly related infective agent. In other cases, after a first infection and the partial or apparent restoration of health, the pathogen remains in the body, and the condition of non-susceptibility persists only as long as it is present. With its disappearance, susceptibility to the same or an allied agent once again develops. This condition has been described in French literature as 'premunity', and it is proposed to substitute this term in phytopathology for the state hitherto designated 'acquired immunity' [ibid., xxiii, p. 139].

FENNE (S. B.). **Summary of results of Tobacco blue mold (downy mildew) control demonstrations in Virginia, 1946.**—*Plant Dis. Reptr*, xxx, 10, pp. 382–384, 1946. [Mimeographed.]

During 1946 some 85 demonstrations in the use of fermate against tobacco blue mould or downy mildew (*Peronospora tabacina*) [*R.A.M.*, xxiii, p. 45; xxv, p. 5

were set up in Virginia. Over 50 reports were received from those co-operating, virtually all of whom expressed satisfaction with the treatment. Little infection (and that not severe) was present in most of the treated beds, whereas most unsprayed beds were a total loss and in almost all the remainder transplanting was delayed by about two weeks and the number of plants obtained amounted to only about 65 per cent. of those from the treated beds. It is estimated that over 50 per cent. of the growers in the flue-cured area and approximately 25 per cent. in the dark and Burley areas sprayed with fermate. In consequence, there was an ample supply of plants for the tobacco acreage in all three belts.

TEMME (J.). **Natrot bij Tabak (Nicotiana tabacum). Voorloopige mededeeling over een nog niet eerder beschreven bacterieziekte der Tabak.** [Wet rot of Tobacco (*Nicotiana tabacum*). Preliminary note on a hitherto undescribed bacterial disease of Tobacco.]—*Tijdschr. PlZiekt.*, xlix, 4, pp. 113–116, 2 pl., 1943. [Received November, 1946.]

In July, 1942, tobacco leaves, submitted to the Phytopathological Service at Wageningen, had rotten, brown, moist lesions along the main and lateral veins, from which a bacterium of the *Erwinia* group, designated 'strain 1', was isolated in pure culture. Inoculation experiments were successful only when the bacterial suspension was introduced through a capillary tube into the main vein. The organism measures 1 to 4·5 by 0·5 to 1 μ and is motile by peritrichous flagella. It is Gram-negative and forms on a yeast water-glucose agar medium dry, shallow colonies with a ridged margin, at first transparent, of a watery consistency, with a bluish-shot effect in transmitted light, later becoming white and opaque, and the periphery finally turning dirty yellow. 'Strain 1' differs from the related *E. aroideae*, the agent of a bulb, stem, and petiole rot in *Zantedeschia aethiopica* [*R.A.M.*, xx, p. 451], in its conspicuously pointed extremities, failure to coagulate litmus milk, and inability to convert raffinose and glycerol into acid; the carbohydrates utilized for this purpose are glucose, levulose, galactose, saccharose, maltose, lactose, arabinose, xylose, and mannitol. Gas is not developed either from sugars or as an accompaniment to the reduction of nitrates to nitrites. Neither cellulose nor starch is attacked, but the pectin in the middle lamellae of raw potatoes undergoes complete dissolution. The physiological and morphological characters of 'strain 1' are regarded as sufficiently distinctive to entitle it to rank as a new species, *E. nicotianae*.

F. A. Wolf, in 'Tobacco diseases and decays' [ibid., xv, p. 402], describes under the name of 'hollow stalk and black leg' a wet rot due to *E. aroideae* [cf. ibid., xviii, p. 481]. This may be identical with a 'wilt' of *Nicotiana rustica* reported from Leeuwen (Maas and Waal), in which the stems and petioles bear large, greyish-brown spots, the former dissolving into a slimy, malodorous mass and the latter drooping at the site of invasion; ultimately the foliage shrivels and turns yellow, and the whole plant collapses.

VASUDEVA (R. S.) & LAL (T. B.). **Big bud disease of the Tomato.**—*Indian J. agric. Sci.*, xiv, 2, pp. 160–162, 2 pl., 1946.

In the winter of 1943 two Sutton's Early Market tomato plants at the Imperial Agricultural Research Institute, New Delhi, were observed to be showing symptoms of the tomato big bud virus [*R.A.M.*, xx, pp. 182, 235; xxiv, p. 400], not previously known to occur in India. Characteristic features of the disease included an erect growth habit and floral anomalies, such as adhesion, virescence, certain types of overgrowth, and thickening of the pedicels due to the formation in the phloem of an abnormal tissue. The disease was transmitted to healthy plants by grafting only, the time required for infection being 48 days in the budding tests and 105 where the inarching method was used.

JUMELET (A.) & VAN KOOT (Y.). **Factoren, die het optreden van neusrot bij Tomaat bepalen.** [Factors determining the occurrence of Tomato blossom-end rot.]—*Tijdschr. PlZiekt.*, li, 4, pp. 93–115, 1 pl., 5 graphs, 1945. [English summary.]

The writers' investigations on blossom-end rot of the tomato in Westland, Holland, were primarily concerned with the influence on the disorder of the type and properties of the soil. The plants were grown in pots containing (*a*) peat, (*b*) sand with an admixture of humus, and (*c*) clay of little buffering capacity, all adjusted to three pH values, acid, medium acid, and alkaline: to these were added single or compound fertilizers, the former consisting of 30 gm. ammonium sulphate, 42 gm. superphosphate, and 28 gm. potassium magnesium sulphate and the latter of 26 gm. potassium nitrate and 14 gm. diammonium phosphate. During growth the salt concentration sank appreciably. Blossom-end rot assumed a very severe form at first, especially on soils of a low pH with a high salt concentration [*R.A.M.*, xxi, pp. 393, 541; xxiii, p. 502], but later it virtually disappeared. In this experiment soil type exerted little influence on the incidence of the disorder because its effects were neutralized by differences in the hydrogen-ion concentration. The combination of a low pH and a high salt concentration markedly increased the incidence of blossom-end rot, and except on peat the interaction between these two factors tended to intensify the adverse effects of each.

ANDRUS (C. F.). **Resistance of Tomato varieties to late blight in South Carolina.**—*Plant Dis. Reptr*, xxx, 8, pp. 269–270, 1946. [Mimeographed.]

During a severe epidemic of tomato late blight (*Phytophthora infestans*) in South Carolina during May, 1946, the following varieties were found to be resistant: Adelaide Dwarf, Australian Earliana, Burwood Prize, Chemin Early Red, Danish Extra Early, Determinate Shipper, Dobbie's Champion, Dobbie's Holyrood, Dwarf Earliest Red, Garden State, Marvana, Potentate, Primrose Gage, San Marzano, Ventura, Vetomold, and Westlandia.

CASS SMITH (W. P.) & GOSS (O. M.). **Bacterial canker of Tomatoes.**—*J. Dep. Agric. W. Aust.*, xxiii, 2, pp. 147–156, 7 figs., 1946.

Bacterial canker of tomatoes (*Aplanobacter* [*Corynebacterium*] *michiganense*) was first recorded for Western Australia in December, 1945, in the Wanneroo and Balcatta areas and was subsequently identified from the Denmark and Coogee districts. The disease is believed to have been introduced in seed stocks from the eastern States of Australia [*R.A.M.*, xviii, p. 279; xxiii, p. 155], three badly infested and widely separated crops of the Tatura variety being traced to the same sources of seed. The widespread practice of using home-produced seed should do much to prevent spread and to assist control of the disease. Dissemination either in seed-bed or field may take place by handling a diseased seedling prior to a healthy one during transplanting; during pruning [ibid., xxiii, p. 414], when cutting of a diseased plant may cause transmission to subsequently cut healthy ones; and by splashes from sprinklers and rain, particularly when wounds are present, which on fruit may cause surface spots and lower the market value. The disease may persist in the soil and infect the following crop.

As primary dissemination is due to infected seed it is imperative that seed should be saved only from crops entirely free from *C. michiganense*. Seed should be extracted by fermenting the pulped fruit without water for four days in a cool, shady place, the fermenting material being stirred night and morning to submerge floating pulp. Purchased seed or seed unavoidably saved from crops found to be even lightly infected should be sterilized by steeping for 25 minutes in water at 122° F. or for 24 hours in 0·6 per cent. glacial acetic acid solution (1 fl. oz. acid per gal.

water). Hot-water treatment is effective against all other seed-borne tomato diseases. Seed should be well dried after treatment and dusted before planting with spergon or any organic mercury dust, such as ceresan or agrosan. Diseased crop refuse should be burned, not ploughed in, owing to the viability of the pathogen for at least two years in the soil. Infested land should not be used for tomatoes for at least three years. Seed-bed sites should be changed at each planting and permanent seed-boxes should be drenched with 2 per cent. formalin (1 gal. commercial formalin in 49 gals. water) or 2 per cent. copper sulphate (1 lb. in 5 gals.). When a diseased plant is cut during pruning, hands and knives should be washed in soapy water; diseased plants should be rogued and burned.

The pathogen was most easily isolated from the expressed sap of petioles of newly infected leaves by plating on potato dextrose or potato dextrose-peptone agar. The reactions obtained agreed closely with those for *C. michiganense,* except that the organism failed to liquefy gelatine. Needle inoculation tests through the stem bases of healthy plants induced clear symptoms of *C. michiganense* after 12 days, the lower leaves wilting and beginning to wither. Death of the plants occurred in 32 days, the controls remaining uninfected. An organism identical in all respects with the original was recovered from the petioles.

In seed-treatment experiments exposure to water at temperatures of 50° or over for 25 minutes [cf. ibid., xxv, p. 530] exterminated the canker organism in water suspension; seed suffered no loss of germination capacity nor injury to subsequent growth.

Palti (J.) & Chorin (M.). **Leaf mould (Cladosporium fulvum) of Tomatoes.**—*Hassadeh,* xxvi, pp. 449–450, 2 figs., 1946. [Hebrew.]

Tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xxiv, p. 343] appears in the coastal regions of Palestine in early July, in Upper Galilee during the late summer, and in the Jordan Valley in the winter and spring. The Marmande, Stoffert's Immun, and Devon Surprise varieties are the most susceptible. An important control measure consists in the avoidance of excessive irrigation, which promotes the high humidity favouring the spread of the disease. Sulfinette or cita Californian spray at 1·5 per cent. are effective against leaf mould alone, but if other pathogens, e.g., *Alternaria* [*solani*] and *Septoria* [*lycopersici*], are to be simultaneously combated, dilute copper sprays, such as 0·75 per cent. Bordeaux or 0·25 per cent. perenox, should be used. Where the disease is prevalent, the treatments should begin four to five weeks after planting and be repeated at 5- to 7-day intervals during active growth and thenceforward every 7 to 10 days.

Mix (A. J.). **Observations on some species of Taphrina.**—*Plant Dis. Reptr,* xxx, 8, pp. 280–282, 1946. [Mimeographed.]

Short notes are given on infections of *Prunus* and *Quercus* spp. by species of *Taphrina* noted in Kansas during 1946, including *T. caerulescens* on the latter hosts.

Clapper (R. B.), Gravatt (G. F.), & Stout (D. C.). **Endothia canker on post Oak.** —*Plant Dis. Reptr,* xxx, 10, p. 381, 1946. [Mimeographed.]

Endothia parasitica [*R.A.M.*, xxv, p. 15] is reported as the cause of severe damage of post oak (*Quercus stellata*) at Port Republic and many other places in Maryland, Mt. Vernon and elsewhere in Virginia, in the District of Columbia, and southern Pennsylvania, while infected post oaks were noted at Roanoke, Virginia, Knoxville, Tennessee, New Haven, Connecticut, and Athens, Georgia. In a single area in Connecticut over 30 per cent. of the trees were attacked. American and Asiatic chestnuts were successfully inoculated with the fungus from post oak.

FREZZI (M. J.). **La presencia del 'Fusarium bulbigenum v. blasticola' en la República Argentina.** [The presence of *Fusarium bulbigenum* var. *blasticola* in the Argentine Republic.]—*Physis, B. Aires,* xv, 47, pp. 87–97, 6 figs., 1939. [Received September, 1946.]

This is an abridgement of a thesis presented by the author to the University of La Plata in 1935 on the symptomatology, etiology, pathogenicity, cultural characters, and control of *Fusarium bulbigenum* var. *blasticola* [cf. *R.A.M.*, xvii, p. 368], the agent of damping-off in *Pinus pinea* and other *P.* and *Cupressus* spp., reported for the first time from Argentina. The fungus produces continuous, hyaline, granular macro- and microconidia, the former measuring 11·25 to 26·25 by 3·75 to 5·6 and the latter 6·75 to 7·5 by 3 to 3·75 μ; these organs develop in profusion in 48-hour cultures at 21° C. on 1 per cent. potato dextrose, malt extract, and maize agars throughout a pH range of 5·1 to 9·2. The cream-coloured sporodochia, appearing between the 20th and 30th days of culture, also give rise to macro- and microconidia; the former are fusoid, curved, pedicellate, predominantly tri-, sometimes quadri- or quinqueseptate, and measure 34 to 41·5 by 3·5 to 4·5 μ, and the latter ovoid, 4·5 to 5·5 by 3·5 to 5 μ. The spherical, smooth, mustard-coloured chlamydospores occupying the centre, or occasionally one of the extremities, of the macroconidia measure 7·5 to 10·5 μ in diameter; they germinate immediately on liberation by means of a slender, hyaline, septate germ-tube, which in turn produces an abundance of hyphae, 4 to 5·2 μ in diameter, and the original conidial phase.

Inoculation experiments on *P. pinea* seedlings induced the typical symptoms of damping-off, the wet, dark chestnut-coloured rot progressing slowly upwards and downwards; the dense, whitish, velvety hyphae developing on the necrotic areas serve to differentiate the infection from that caused by other *F.* spp. or *Pythium ultimum*.

A scheme for the control of the disease based on North American experience is outlined.

LOMBARD (FRANCES F.) & DAVIDSON (R. W.). **An undescribed Coryneum on diseased Italian Cypress.**—*Phytopathology,* xxxvi, 9, pp. 775–777, 1 fig., 1946.

Coryneum asperulum n.sp. was found on dead terminal buds, leaves, and branchlets of an Italian cypress (*Cupressus sempervirens*) near Montgomery, Alabama, but evidence of its pathogenicity is not yet forthcoming. The acervuli of the fungus, which are sparsely distributed over the leaf surfaces, are black, erumpent, pulvinate, usually circular, 50 to 200 μ in diameter, and the conidia oblong to fusoid, slightly roughened, typically triseptate, olive-grey, 27 to 32 by 5 to 6 (range 19 to 40·6 by 3·6 to 6) μ, borne on short, simple conidiophores; paraphyses are absent.

Of the twelve species of *Coryneum* previously described on conifers, two occur on cypress, namely, *C. cardinale* on *Cupressus macrocarpa* and other *C.* spp. [*R.A.M.*, xviii, p. 492] and *Coryneum berckmanii* on *Cupressus sempervirens* var. *stricta* [ibid., xix, p. 684]. Both these species differ from *Coryneum asperulum* in their quinqueseptate spores, and in fact, only three of the twelve reported on conifers belong to the triseptate group, namely, *C. bicorne* on *Abies pectinata* in Denmark, *C. thyicolum* on *Thuja occidentalis* in Sweden, and *C. cinereum* on *Pinus contorta* and *P. murrayana* in Oregon and Colorado: *C. asperulum* differs from these in the shape and size of its conidia.

BRUNSTETTER (B. C.), MYERS (A. T.), LAMBERT (M. L.), & BUCHANAN (T. S.). **The chloride content of conifers.**—*Science,* civ, 2705, pp. 415–416, 1946.

The analysis for chlorides of 68 samples of shortleaf pine (*Pinus echinata*) needles, collected in 1942 from the previous year's middle-crown growth in 15 localities of six southern States of the American Union, disclosed no apparent correlation between chloride content and 'little leaf' [*R.A.M.*, xxv, p. 297].

Verrall (A. F.). **Preservative treatments for use on wood off the ground.**—*Agric. Engng, St. Joseph, Mich.*, xxvii, 8, pp. 367–370, 2 figs., 1946.

Cold soak and brush treatments with 5 per cent. pentachlorophenol and copper naphthenate (4·5 per cent. for the former and 18 for the latter method) and a cold soak with 0·2 per cent. phenyl mercuric oleate were applied to southern yellow pine sapwood in specially designed units exposed outdoors, above ground, and subject to rain seepage at joints, at the Harrison Experimental Forest, near Saucier, Missouri. The periods of immersion in soak treatments were 15, 30, or 60 minutes, or alternatively two coats were given with a paint-brush at an hour's interval, all the solutions being applied at air temperature. After 3½ to 4 years' exposure there was no appreciable difference in efficacy between the two methods of treatment or the three periods of immersion. Some evidence was obtained that the treatments not only prevent early decay (largely due to *Lenzites sepiaria*), but tend to retard the discoloration of painted surfaces by the black mould [? *Cladosporium herbarum* var. *nigricans*: *R.A.M.*, xxv, p. 177] prevalent in the Gulf States; they should not, however, be relied upon as substitutes for ordinary control measures in localities where paint moulding is severe.

Flügge (R.). **Die gesamte Schutzbehandlung des Bauholzes. Zweite, erweiterte Auflage.** [The general protective treatment of timber. Second, enlarged edition.]—132 pp., 49 figs., 5 diags., Halle (Saale), Carl Marhold Verlagsbuchhandlung, 1943. [Received November, 1946.]

The author has assembled and condensed much valuable information concerning various aspects of timber protection, including the control of fungal rots, with special reference to war conditions in Germany and the countries annexed or occupied at the time of publication.

Taylor (C. F.) & Rupert (J. A.). **A study of vegetable seed protectants.**—*Phytopathology*, xxxvi, 9, pp. 726–749, 9 graphs, 1946.

Using refined methods of technique, the writers made a study, at the West Virginia Agricultural Experiment Station in 1942–3, of the comparative value of numerous chemicals applied as dusts to vegetable seeds for the control of damping-off, caused principally by *Pythium ultimum* [cf. *R.A.M.*, xxiii, pp. 507, 509].

Arasan and other mixtures of tetramethyl thiuramdisulphide, e.g., thiosan (now known as tersan [ibid., xxv, p. 397]), were the most effective and persistent of the fungicides tested on spinach [ibid., xxiii, p. 328; xxiv, pp. 1, 365], cucumber, carrot, cabbage, and tomato [ibid., xxiii, p. 371]. Lettuce responded more favourably to cuprocide and was liable to injury from arasan and fermate; in other cases the last-named approximated to arasan in efficiency. The protective action of cuprocide was generally of brief duration, and silver oxide is open to a similar objection; silver chromate at very high dosages gave satisfactory control. Spergon proved unsatisfactory as a seed-protectant in these studies.

Luttrell (E. S.). **A pycnidial strain of Macrophomina phaseoli.**—*Phytopathology*, xxxvi, 11, pp. 978–980, 1946.

A strain (No. 75) of *Macrophomina phaseoli* producing pycnidia and pycnospores, 14 to 30·8 by 7 to 11·2 μ, on agar media was isolated in 1944 at the Georgia Experiment Station from the hypocotyl tissue of a snap bean [*Phaseolus vulgaris*] seedling with symptoms of charcoal rot [*R.A.M.*, xxiv, pp. 270, 303]. A year later 20 single pycnospore isolations were made from the same strain, all of which resembled the original and produced pycnospores in culture. No. 75 is the only one of 58 isolates examined in the course of a study on *M. phaseoli* to form pycnidia on agar media. Of various other methods tried for this purpose, the most satisfactory consisted in

the inoculation of sterilized 10-in. lengths of dried bean stems inserted in large culture tubes with their bases immersed in water to a depth of 2 in. Of 35 isolates (17 from Georgia and 18 from other States) tested in this way, 20 formed pycnidia, often elongated, compound, coralloid structures projecting above the sclerotial crusts scattered along the stems, within a month. The length of the pycnospores ranged from 14 to 33·6 and their width from 5·9 to 11·8 μ, and the hosts (besides bean) producing them were cowpea, Lima bean [*P. lunatus*], *Cassia nictitans*, *Crotalaria intermedia*, *Lespedeza* sp., *Lactuca scariola*, coffee weed [*Ditremexa occidentalis*], sweet potato, cantaloupe, tomato, maize, and sorghum [ibid., xxiv, p. 96]. Inoculations with pycnospore suspensions from cultures of strain No. 75 on unwounded stems and leaves on Tendergreen snap bean plants of all ages resulted after incubation in a moist chamber in the development of typical symptoms within a fortnight. The use of pycnospore suspensions gave uniformly successful results when other methods of inoculation failed.

Townsend (G. R.), Emerson (R. A.), & Newhall (A. G.). **Resistance to Cercospora apii Fres. in Celery (Apium graveolens var. dulce.).**—*Phytopathology*, xxxvi, 11, pp. 980–982, 1 fig., 1946.

Of 48 foreign collections of celery tested for their reactions to early blight (*Cercospora apii*) at the Everglades Experiment Station, Belle Glade, Florida, in 1940–1, seven varieties of Turkish origin remained free from the disease and produced vigorous plants. During 1943–4 the F_1 plants from four crosses between two resistant Turkish lines and Cornell 19 were kept in a greenhouse at Cornell University, and in the following winter nine F_2 selections from these crosses were grown in the field in Florida. Most of the plants in these lines combined horticulturally attractive characters with resistance to *C. apii*, and 17 out of 28 sent to Ithaca, New York, in March, 1945, produced seed, as also did 19 other F_2 lines selected at Ithaca the previous summer. Of 35 F_3 lines grown in Florida during the winter of 1945–6, eight developed less infection than is usually found in well-sprayed fields of the uniformly susceptible native American varieties. Several of the selections are of high quality, with very heavy, crisp petioles, predominantly of the green colour generally associated with resistance to *C. apii*, which is attributed to more than one genetic factor.

Smith (M. A.). **Bacterial spot of Honeydew Melon.**—*Phytopathology*, xxxvi, 11, pp. 943–949, 1 fig., 1946.

A hitherto unreported disease of honeydew melons (*Cucumis melo* var. *inodorus*), part of a Colorado consignment arriving at Chicago in September, 1944, is described. The morphological characters of the organism isolated from the slightly sunken, circular to oblong, water-soaked, greenish-tan spots, 2 to 6 mm. in diameter, or coalescent, and brown to black, on the diseased fruits were compared with those of *Pseudomonas lacrymans* [*R.A.M.*, xi, p. 18; xiii, p. 419] and found to be indistinguishable, while further evidence of identity was afforded by the results of cultural and biochemical tests with both bacteria. Moreover, cross-inoculation experiments on honeydew melons and cucumbers with the isolate from the former and *P. lacrymans* showed that both organisms were pathogenic to the fruits, leaves, and stems of the two hosts. It is proposed, therefore, to refer the honeydew melon bacterium to *P. lacrymans*.

Jenkins (J. M.). **Studies on the inheritance of downy mildew resistance and of other characters in Cucumbers.**—*J. Hered.*, xxxvii, 9, pp. 267–271, 2 figs., 1946.

This study of resistance to downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) of cucumbers [*R.A.M.*, xxi, p. 317] and its mode of inheritance in a cross between Puerto Rico No. 37 and a susceptible inbred line Minnesota No. 36

suggested the desirability of using in the F_2 and later generations relatively large seedling populations, which should be inoculated at this stage and susceptible plants removed before transplantation to the field. This would have the effect of limiting the field populations to those individuals with seedling resistance, these almost invariably showing field resistance also, after which selections in the field for desirable commercial characters and resistance to *P. cubensis* should prove possible. Among the F_3 lines, one exhibited an average resistance similar to that of the resistant parent.

PIZER (N. H.). **The value of ground gypsum in making Mushroom composts.**—*Mushroom Gr. Yearb., 1946*, pp. 41–43, 1946.

In the course of this popular account of the value of ground gypsum in mushroom composts [*R.A.M.*, xviii, p. 229] the author questions some variations of practice instituted since he first described the treatment ten years ago and still recommends that the product should be added when the manure is first shaken out and made into a heap for composting.

LING (L.) & LIN (K. R.). **On the occurrence of Colletotrichum capsici in China.**—*Indian J. agric. Sci.*, xiv, 2, pp. 162–167, 1 fig., 1 map, 1944. [Received November, 1946.]

The first record of *Colletotrichum capsici* in China was made by Sydow (*Ann. mycol., Berl.*, xvii, pp. 140–143, 1919) from Canton, and it was again reported by Teng (*Sinensia*, ix, pp. 219–258, 1938) as occurring in Kwangsi. It has recently been found causing a ripe rot of chilli, eggplant, and tomato fruits in Chengtu Plain, Szechuan Province. The fungus appears to be restricted to tropical and subtropical regions, and except for Buenos Aires, Argentina (latitude 35° south), where it has been observed on chilli, *C. capsici* is found exclusively within the zone northward from the equator to latitude 32°.

The morphological features of the authors' isolates from the three abovementioned hosts were in close mutual agreement and also approximated to those described by Dastur from India [*R.A.M.*, i, p. 195]. Some differences were noted, however, in the mode of germination of the three strains. The germ-tubes of the chilli isolate are broader than those of the other two and branch profusely at an early stage, while the germ-tubes of the tomato and eggplant strains usually grow for several hundred microns before branching; appressoria were formed only by the tomato isolate. The cultural characters on standard media, of which potato dextrose agar proved to be the most suitable, are essentially similar to those of *Glomerella glycines* from soy-bean [ibid., xix, p. 512] and *C. truncatum* [ibid., xv, p. 272] from garden bean [*Phaseolus vulgaris*]. Conidia were produced from the aerial hyphae but tended to be smaller than those originating in the acervuli.

In comparative inoculation experiments with *C. capsici*, *C. indicum* [ibid., xxiv, p. 148], and *G. glycines*, the first-named readily attacks its natural hosts, tomato, chilli, and eggplant. As already shown by Higgins [ibid., x, p. 56], the immature chilli fruits are as susceptible to infection as older ones, but the rot does not develop until they ripen. Inoculation of the inflorescences results in blossom blight, but the die-back phase of the disease, reported to be prevalent in India, has not been observed in China either on naturally or artificially infected plants. Inoculated into detached fruits or tubers, the three isolates of *C. capsici* and *G. glycines* were alike pathogenic to tomato, chilli, eggplant, and soy-bean, but not to potato and cotton, whereas *C. indicum* attacked all the experimental plants except potato and caused decay of cotton bolls. *C. capsici* is readily distinguishable from the other two species by its incapacity to infect its natural hosts in the seedling stage. Of the plants reported by Sundararaman [ibid., vii, p. 678] to be susceptible to *C. capsici*, the yellowing basal leaves of cabbage and the detached fruit clusters of *Solanum*

nigrum and *Datura album* rapidly contracted infection, whereas plants in active growth remained immune.

The taxonomy of *C. capsici* is briefly discussed in relation to its position within the group of species characterized mostly by falcate conidia and dense stromata. Only in one representative of the group, *G. glycines*, has the ascigerous stage been discovered, and the taxonomy of the others, based on the imperfect state alone, is still very obscure.

PERSON (L. H.). **The soil rot of Sweet Potatoes and its control with sulphur.**—*Phytopathology*, xxxvi, 10, pp. 869–875, 1946.

Soil rot of sweet potatoes (*Actinomyces ipomoea*) [*R.A.M.*, xxiv, p. 352], which has caused heavy losses since 1934 in Louisiana soils with a pH of 5·6 to 5·8, has been effectively combated by the application of sulphur at 600 to 800 lb. per acre, resulting in the reduction of the pH to 5 and its maintenance at that level for four to six years. The treatment has virtually eliminated losses from the disease, and in fact, in the better fields increases of 120 to 160 crates per acre from the areas receiving sulphur are not uncommon. Low rainfall at the time of root production by the young plants aggravated the intensity of soil rot during the period of observation, damage from this source having been negligible in very wet seasons.

VENKATARAYAN (S. V.). **A natural fungous parasite of powdery mildew on Cyamopsis psoraloides DC.**—*Curr. Sci.*, xv, 11, p. 319, 1946.

The powdery mildew, *Leveillula* [*Oidiopsis*] *taurica*, which developed in profusion on the cluster bean (*Cyamopsis psoraloides*) in Bangalore in September and October, 1946, was found to be parasitized by *Cicinnobolus cesatii* [*R.A.M.*, xxiv, p. 476]. The hyperparasite is listed by Butler and Bisby [ibid., xi, p. 545] as occurring on *Oidium* in India, but this record is the first of its presence on *Oidiopsis taurica* in the country. Under favourable conditions the mildew causes considerable defoliation, so that the inhibitory properties of its parasite are evidently only moderate, though probably sufficient to arrest the full development and spread of the fungus.

LUTTRELL (E. S.). **Black rot of Muscadine Grapes.**—*Phytopathology*, xxxvi, 11, pp. 905–924, 3 figs., 1946.

Black rot is a prevalent and conspicuous disease of muscadine grapes (*Vitis rotundifolia*) in Georgia [*R.A.M.*, xxv, p. 332], primarily affecting the vegetative system. It causes a leaf spot, canker or blight of the petioles, tendrils, stems, and flower clusters, and a superficial scab or canker of the berries, but does not appreciably impair the yield. Muscadines vary considerably in their reaction to black rot, Dulcet and Thomas, for instance, having relatively resistant foliage and quasi-immune berries; they are, however, less productive than the susceptible Hunt.

Guignardia bidwellii f. *muscadinii* n.f., the agent of muscadine grape black rot, is distinguishable in pathogenicity from *G. bidwellii*, which causes complete mummification of bunch grapes, but the associated morphological differences, both in nature and in culture, are only slight. The new form grows less rapidly than the species proper, and its perithecia are smaller (61·2 to 112, mean 84·3, compared with 95·2 to 198·8, mean 146·5 μ), the ascospores larger (13·5 to 17·3 by 6 to 9, mean 14·9 by 7·2, as against 11·3 to 16·5 by 6 to 6·8, mean 13·5 by 6·6 μ), and the pycnospores longer (8 to 13·3 by 6 to 6·7, mean 9·3 by 6·3, and 8 to 12 by 6·4 to 6·7, mean 8·5 by 6·6 μ, respectively).

In cross-inoculation tests on bunch and muscadine grapes, both *G. bidwellii* and its f. *muscadinii* proved capable of attacking a European variety of the former (*V. vinifera*), but the new form was innocuous to the native Warren and Niagara (*V. bourquina* Munson ex Viala and *V. labrusca*, respectively), and the species

proper did not infect muscadines. The genetic connexion of the pycnidial and perithecial states of both pathogens was also demonstrated by these experiments.

The results of spraying tests did not encourage the general adoption of the practice for black-rot control on muscadines, which can be achieved by sound cultural measures, such as selection of appropriate vineyard sites and rational methods of cultivation, soil amendment, pruning, and sanitation.

ADAM (D. B.). **Downy mildew of the Vine.**—*J. Dep. Agric. S. Aust.*, l, 2, pp. 91–95, 5 figs., 1946.

Vine downy mildew [*Plasmopara viticola*], which was first recorded in Australian commercial vineyards in 1917 in the Rutherglen region of Victoria, appeared in the Clare and River Murray districts of South Australia in 1921 and recurred in a mild form in succeeding years until 1925. Since that date there had been no reports of the disease in the latter State until February, 1946, when a severe outbreak occurred in the comparatively small and isolated settlement of Coonawarra, where extensive leaf injury and defoliation, combined with adverse seasonal conditions, greatly impaired the value of the crop for wine manufacture. The symptoms of the disease, the influence of weather on its development, and the life-history of the causal organism are described in popular terms, and an outline of the standard control measures employed in other countries is given.

JENSEN (D. D.). **Virus diseases of plants and their insect vectors with special reference to Hawaii.**—*Proc. Hawaii. ent. Soc.*, xii, 3, pp. 535–610, 1946.

This presidential address to the Hawaiian Entomological Society, delivered on 10th December, 1945, falls into three parts, namely, (I) principles of insect transmission of plant viruses; (II) insect species occurring in Hawaii known to transmit plant viruses, with a list of viruses transmitted by each; and (III) plant virus diseases known or reported to occur in Hawaii with special reference to their transmission by insects. Most of the papers listed in the bibliography of 251 titles have been noticed in this *Review* from time to time.

CIFERRI (R.). **Relazione sull' attività del Laboratorio Crittogamico, dell' Osservatorio Fitopatologico e del Centro Studi sugli Anticrittogamici durante gli anni 1944 e 1945.** [Report on the activity of the Cryptogamic Laboratory, the Phytopathological Observatory, and the Centre for Studies on Fungicides during the years 1944 and 1945.]—*Atti Ist. bot. Univ. Pavia*, Ser. 5, v (3), pp. 279–321, 1946.

This report [cf. *R.A.M.*, xxv, p. 251] contains, *inter alia*, the following items of interest. In northern Italy the most prevalent rice disease is blast (*Piricularia oryzae*) [ibid., i, p. 343; xviii, p. 580]. Infection by a *Helminthosporium*, probably *H. oryzae* [*Ophiobolus miyabeanus*: ibid. ix, p. 200], is almost as widespread, but much less serious in its effects. Lupins (*Lupinus densiflorus* and *L. polyphyllus*) growing in the Botanical Gardens, Pavia, were attacked by *Ceratophorum setosum* [ibid., vii, p. 582; xxi, p. 293]. *Taraxacum kok-saghyz* was attacked by *Puccinia taraxaci*, which the author, following Trotter (Uredinales, 140, 1908), regards as distinct from *P. hieracii* [*R.A.M.*, xxiv, p. 4], and by *Ramularia taraxaci*.

A study of the fungus causing 'mal secco' disease of citrus (*Deuterophoma tracheiphila*) [ibid., xxv, p. 497] made on different lemon varieties from various parts of Sicily showed it to be identical with Diedicke's generic description of *Bakerophoma*; comparison with the type species could not be made, but the author considers that the new combination *Bakerophoma tracheiphila* (Petri) Ciferri is justified.

As the apple rot fungus *Sphaeropsis malorum* Berk. [*Diplodia mutila* (Mont.) Fr. 1834, the pycnidial stage of *Physalospora mutila* (Fr.) N. E. Stevens: ibid.,

xiii, p. 312; xv, p. 726] can be placed in the genus *Botryodiplodia*, and a comparison of it with exsiccata of *Labrella pomi* Mont. & Fr. from the collections of Roumeguère and Cavara & Pollacci showed them to be the same, and as the date of Fries's binomial (1834) is anterior to Berkeley's (1836), the author considers that the erection of the new combination *B. pomi* (Mont. & Fr.) Ciferri is justified.

Attention is directed to the necessity of undertaking a thorough study of chestnut blight (*Endothia parasitica*) as it exists in Italy [ibid., xxvi, p. 85].

MUNDKUR (B. B.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst., New Delhi, for the triennium ended 30th June, 1944*, pp. 57–63, 1946.

In this report [cf. *R.A.M.*, xxvi, p. 44] it is stated that in inoculation tests carried out in 1942–3 with 129 wheat varieties 53 took no infection by *Urocystis tritici*, 19 became slightly affected, and the remainder showed high infection. Similar results were obtained in 1943–4. In two years' trials, very fine sulphur dust and dust made from Baluchistan sulphur ore considerably reduced barley covered smut (*Ustilago hordei*) [ibid., xxiv, p. 361]. Of 20 pigeon pea (*Cajanus cajan*) varieties tested in 1942–3 in pots against wilt (*Fusarium udum*) [ibid., xx, p. 496], one, A. 126-4-1 remained unaffected. In 1943–4, IP 80, IP 41, C. 38, C. 15, A. 126-4-1, D. 16-17-2 pt. 12, and D. 33-4-22 were resistant. Bulsar White, reputedly resistant, was severely infected. On field plots inoculated with cultures of the fungus and infected debris, IP 80, IP 41, C. 38, C. 15, and A. 126-4-1 maintained their resistance.

In further experiments on the effect of sowing date on the incidence of gram (*Cicer arietinum*) wilt (*Fusarium orthoceras* var. *ciceris*) [ibid., xxiii, pp. 325, 425], the crop sown in September, [? 1942], was almost destroyed by the disease, which, however, was much less in the October sowings. Early sowing was also found to favour attack by foot rot (*Operculella padwickii*) [ibid., xxi, p. 120]. When *Trichoderma lignorum* [*T. Viride*] was mixed with soil highly infested with *O. padwickii*, no reduction in infection of the gram was observed over a period of three years. In 1943–4 the general level of infection was rather higher in plants from non-vernalized seed than from vernalized.

In the 1941–2 season incidence of potato virus diseases was highest from early February to mid-March. Incidence and severity of infection were much lower on the Himalayan foothills than in the plains. In 1943–4 a nucleus of disease-free tubers of important commercial varieties from severely rogued crops was planted at Kufri, 8,000 ft. above sea-level, the site selected for the Central Station for Seed Potato Certification.

Tomato big bud [ibid., xx, p. 182], due to *Lycopersicum* virus 5 [tomato big bud virus], was recorded for the first time in India [see above, p. 135].

A very virulent strain of sugar-cane red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*: ibid., xxi, p. 348; xxii, p. 408; xxvi, p. 45] was isolated in 1941–2; of 79 varieties inoculated with it, 36 were moderately resistant, 30 moderately susceptible, and 13 highly susceptible. In the resistant varieties the reddening produced was not more than 15 in. long, whereas in the susceptible ones it sometimes reached a length of 60 in. Of 98 varieties tested in 1942–3 and 116 in 1943–4, 22 showed moderate resistance in each trial. Two physiologic races were found, the light, highly pathogenic one mentioned above, and the common, dark, less virulent one. Some subcultures from the light-coloured race were only weakly pathogenic while the dark one gave sometimes more virulent ones.

A thorough inspection of rice leaves and seeds from all parts of India, allegedly infected by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xxv, p. 317], showed that more than half were infected by *Curvularia* [? *spicifera*: cf. ibid., xix, p. 258] and only just over a quarter by *O. miyabeanus*.

HANSFORD (C. G.). **Annual Report of the Senior Plant Pathologist.**—*Rep. Dep. Agric. Uganda, 1944–45* (Part II), pp. 1–4, 1946.

In this report [cf. *R.A.M.*, xxv, p. 27] it is stated that the virus disease of sweet potatoes present in Uganda [ibid., xxiv, p. 117; xxv, pp. 100, 154] shows great variation in its incidence on different varieties and in the severity of the symptoms thereon. Work has been started to ascertain if more than one virus is concerned. The most susceptible period in the growth of the plant appears to be during the first two months after planting the cuttings; after the plants have begun to form a ground cover, spread is extremely slow. Most diseased cuttings quickly die, while even in favourable weather conditions it is very difficult to raise plants from infected cuttings of very susceptible varieties. Wild *Ipomoea* spp. and related plants when grown in the vicinity of affected sweet potatoes showed similar symptoms. Attempts are being made to discover a source of high resistance.

Some sweet potato varieties at Kawanda show a severe stem rot, characterized by superficial black lesions which later deepen and render the stem brittle. Among the fungi isolated was a species of *Plenodomus* more or less corresponding to *P. destruens* [ibid., xxiv, p. 442]. Although the disease is widespread it is unlikely to affect the native crop as a whole owing to the use of resistant varieties.

During the long droughts of recent years banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: ibid., xxiii, p. 410] has become common round Kampala. A rot of the banana heart leaf due to *Helminthosporium musae-sapientum* [ibid., xxiii, p. 409] was noted occasionally. The fungus attacks at some point within the heart of the plant before the leaf has expanded. Infection begins as a water-soaked spot on the leaf blade and spreads to adjacent portions of the tightly rolled leaf, resulting in a band of infected tissue running for some distance down the leaf. Later, the distal part withers.

Blight (*Phytophthora*) [*infestans*] of Irish potatoes is still of major importance in the higher parts of Uganda, particularly in Kigezi and Toro. *Alternaria* blight [*A. solani*], often accompanied by *Cercospora* [? *concors*: ibid., xxiii, p. 410], is the most usual potato disease at Kawanda.

One field of Co. 290 sugar-cane showed heavy leaf spot infection by *C.* [? *longipes*: loc. cit.] without, however, any effect on the yield.

In the section of this report dealing with work on cotton (pp. 36–40), P. E. WEATHERLEY states that in further studies on resistance to blackarm [*Xanthomonas malvacearum*: ibid., xxv, pp. 27, 499] of 114 selected strains, representing 33 varieties sprayed with a suspension of the organism, 28 were selected for possible future use, and 13 for further increase. Markedly resistant progenies of resistant phenotypes selected from the F_2 generation between BP 52 and N 17 were shown to be homozygous and no further elimination is necessary. In variety trials routine lesion counts revealed that resistant selections bear less than half the number of lesions recorded on the parental types. B 181 and its resistant derivatives continued to give the highest yield and always had fewer blackarm lesions than four other varieties tested at 19 centres; BP 50R grown at 17 centres came next in lesion counts, equalled B 181 in yield, and gave the strongest yarns.

Report of the Agricultural Department, Dominica, 1945.—12 pp., [? 1946].

The following notes on plant diseases occur on p. 6 of this report [cf. *R.A.M.*, xxiv, p. 7]. The incidence of withertip of limes (*Gloeosporium limetticola*) did not exceed the average.

W. T. DALE, of the Mycology Department, Imperial College of Agriculture, Trinidad, who visited Dominica from 15th June to 9th July, 1945, to study vanilla diseases, found a root rot to be the principal limiting factor in the cultivation of the crop. Infected material yielded a species of *Fusarium* closely resembling

F. batatatis var. *vanillae* [ibid., xiii, p. 58]. Pending further information control should be based on the use of healthy setts for planting, provision of the right amount of shade, avoidance of over-pollination of flowers, and the application of crushed limestone at the rate of 6 lb. per plant on heavy clay, acid soils and in smaller quantities on lighter and less acid ground.

W. T. Dale also made a survey of the cacao plantations and found the health of the crop reasonably satisfactory. The most serious trouble is the root rot caused by *Rosellinia* spp., while *Phytophthora palmivora* is responsible for slight damage in the wetter districts. *Inga* spp., breadfruit [*Artocarpus communis*], and avocado are highly susceptible to the *Rosellinia* root rot and should be excluded from the vicinity of new cacao plantings.

The average monthly incidence of Panama disease of bananas (*F.* [*oxysporum* var.] *cubense*) was 8·52 per cent. infected stools compared with 2·55 per cent. in the previous year.

The tobacco-mosaic virus was present in a high proportion of the plants at Hillsborough Estate.

Annual Report of the Agricultural Experiment Station, Florida, for the year ending June 30, 1945.—229+vii pp., 13 figs., 1 diag., 8 graphs, [? 1946].

In the plant pathology section (pp. 89–98) of this report [cf. *R.A.M.*, xx, p. 562] investigations by E. West into the host relations and factors influencing the growth and pathogenicity to lupins of *Sclerotium rolfsii* [ibid., xxiv, p. 20; xxv, p. 20] showed that more plants survived in field sand than in mixtures with leaf mould. This suggests that *S. rolfsii* spreads more quickly in soil containing organic matter. Stock cultures of 14 *S. rolfsii* strains and variants (some of which had been in culture for several years) proved equally pathogenic to lupin seedlings.

W. B. Tisdale, A. N. Brooks, and A. L. Harrison investigated the causes of failure of seed and seedlings in various Florida soils and devised methods for preventing it. Arasan, 2 per cent. ceresan, Dow 9B and 1452–F, both at 0·25, and a copper bronze powder at 0·5 per cent. were used on seed sown in soil inoculated with *Pythium irregulare* and *P. splendens*, of which the former was much the more virulent to lettuce; all treatments proved more effective against the latter. Emergence of arasan-treated lettuce seed in soil infested with *P. irregulare* amounted to 41·6 per cent. as against 0·6 from untreated seed. Other treatments were inferior but all gave significant increases except Dow 9B. In soil inoculated with *P. splendens* emergence from untreated seed was 40 and from that treated with arasan and 1452–F 78 and 79 per cent., respectively. Other treatments were less effective. In similar experiments *P. splendens* proved to be more virulent to spinach than *P. irregulare*, against which, however, arasan alone proved effective [ibid., xxiv, p. 365]; all except Dow 9B significantly controlled *P. splendens*.

P. Decker describes eggplant-breeding experiments for resistance to blight (*Phomopsis*) [*vexans*], during which 76 hybrid families [ibid., xxii, p. 194] were selected from the 1944 crops.

Observations on soil-treatment plots made by W. B. Tisdale and A. N. Brooks showed that turning under vegetation a short time before planting Lima and snap beans and cabbage increased the damage caused by *Rhizoctonia* [*Corticium solani*].

E. West isolated from several specimens of *Camellia japonica* suffering from die-back disease mostly *Diplodia* sp., sometimes mixed with *Phomopsis* sp., or occasionally the latter alone. Very few isolations of *Gloeosporium* sp. were encountered, although this pathogen has been reported as the major cause of die back in other parts of the United States [ibid., xxv, p. 561]. *D.* (?) *camelliae* was found fruiting on two specimens.

The same author records that pruning of oleander plants in the greenhouse to remove all traces of witches' broom and cankers produced by inoculation [? with *Sphaeropsis* sp.: ibid., xvii, p. 324] was followed by the emergence of new brooms on the old stems and one plant died with a canker.

W. B. Tisdale found that dusting with zerlate, fermate, or spergon considerably increased the yield of the Abbott and Cobb cucumber variety, suffering from downy mildew [*Pseudoperonospora cubensis*].

A species of *Pythium* isolated by W. B. Tisdale and G. D. Ruehle from diseased roots of Easter lilies [*Lilium longiflorum*] grown commercially in Dade County proved by cultural characters and cross-inoculations to be identical with the species causing root rot of Chinese evergreen (*Aglaonema simplex*: *Rep. Fla. agric. Exp. Sta., 1943*). Cultures from both hosts have been identified by J. T. Middleton as *P. splendens*. The pathogen appears to have a wide distribution in the State probably due to dissemination on bulbs and cuttings. The root systems of vigorous plants were almost completely destroyed in 21 days.

H. A. Eddins (pp. 108–111) reports that ring rot of potatoes (*Corynebacterium sepedonicum*) appeared only in fields where the tubers used came from areas where a zero tolerance of the disease was not required for certification. Reduction in yield of Katahdin potatoes caused by a 16 or more per cent. infection with leaf roll reflected the importance of planting tubers free from this disease. Complete resistance to leaf roll was shown by 17 seedling crosses from the Maine Agricultural Experiment Station [*R.A.M.*, xxv, p. 573] when grown in the Hastings area. Hybrid X 1276 × 278 had the most desirable qualities. A USDA seedling hybrid, B70–5, resistant to late blight (*Phytophthora infestans*), when grown at Hastings proved resistant to drought and heat and gave an excellent yield. The value of planting Sebago and Katahdin, varieties resistant to brown rot (*Bacterium* [*Xanthomonas*] *solanacearum*), was illustrated in the Hastings area where losses from this disease in a season favouring the pathogen were only 1 per cent. [ibid., xv, p. 781].

Good control of cucumber downy mildew was secured by A. L. Harrison and D. G. A. Kelbert (pp. 121–122) with copper compound A (2 lb. per 100 gals. water and later 4–100), fermate (3–100), and dithane-zinc sulphate-lime (2–1–0·5–100), giving 11 applications at 2- to 6-day intervals. Adjacent unsprayed plants were entirely defoliated before maturation. Varieties resistant to *Pseudoperonospora cubensis* are being developed from crosses between the resistant hybrids Puerto Rico No. 39 and China and commercial varieties.

H. I. Borders (p. 138) found that fermate-zinc sulphate-lime at 2–1–0·5–100 gave best control of papaw target leaf spot [*Mycosphaerella* sp.: ibid., xxiii, p. 492] without injuring the leaf.

According to G. D. Ruehle (p. 145) the use of dithane-zinc sulphate spray on about 95 per cent. of the potato acreage in Dade County prevented late blight from becoming epiphytotic, and controlled early blight [*Alternaria solani*] remarkably well, resulting in record yields.

H. I. Borders and G. D. Ruehle (p. 146) found that of 321 avocado fruits of the Taylor variety from plants sprayed with cuprocide-zinc sulphate-lime (1–1–0·5–100), 96·2 per cent. were free from *Cercospora* [*purpurea*: ibid., xx, p. 483].

Commercial control of stem-end rot [*D. citri* and *Diplodia natalensis*: ibid., xxvi, p. 52] of oranges in the packing-house was obtained by C. R. Stearns (p. 158) using overripe Valencias and ripe Hamlin and Parson Brown fruits treated with 0·75 per cent. dowicide 2, dissolved in an organic solvent-water mixture, and not exposed to ethylene gas.

Intensive investigations of spreading decline of citrus [ibid., xxiii, p. 482] are

described by R. F. Suit (pp. 169–170). It spreads gradually at the rate of one to three trees a year in all directions, irrespective of slope of land or prevailing winds, round the trees first attacked. Progressive weakness accompanies defoliation and cessation of growth and no marketable fruit is borne. The disease is most conspicuous on grapefruit, but oranges and tangerines are seriously affected. No deaths from this disease have yet been reported. Roots of diseased trees showed a 25 to 50 per cent. reduction in the flow of water through them, but there were no abnormalities in the tissues and detached roots showed no tendency to decay. Iodine tests for the presence of starch are considered to be an unreliable criterion in diagnosis of the condition. Various isolates (mostly *Fusarium* spp.) are being tested for pathogenicity.

In thiourea treatment tests [ibid., xxiv, p. 147], undertaken by E. F. Hopkins and K. W. Loucks (pp. 171–175), with Hamlin, Pineapple, and Valencia oranges, 5 per cent. solutions gave virtually complete control of stem-end rot and almost eradicated mould [*Penicillium digitatum* and *P. italicum*]. A process has been developed whereby 5 per cent. thiourea is applied directly in the packing-house process and rinsed off before waxing and polishing the fruit, thus ensuring considerable protection from stem-end rot and mould for at least three weeks after harvesting. Painting the buttons of the fruit with relatively high concentrations of various chemicals and comparing stem-end rot incidence with controls in store showed that merthiolate (1 in 1,000), 10 per cent. 8-hydroxyquinoline sulphate, and 10 per cent. thiourea all gave excellent control. A three-minute dip in 2 to 10 per cent. 8-hydroxyquinoline sulphate resulted in 0 per cent. infection by *Diaporthe citri* in Valencia oranges so treated and either not rinsed or rinsed with 1 per cent. sodium bicarbonate, and in 2 per cent. infection when dipped and rinsed in tap-water, compared with 30 per cent. in undipped.

In experiments with potatoes conducted by G. R. Townsend (p. 210) ethylene chlorhydrine treatment resulted in earlier growth responses, higher stands, yields, and scab [*Actinomyces scabies*] counts than ammonium thiocyanate treatment; both reduced seed-piece decay by effectively breaking dormancy. Late September plantings yielded more potatoes than mid-September or early October plantings, but scab counts were lowest in the later plantings. A significant positive correlation was observed between temperatures during the tuberization period and the percentage incidence of common scab. The lower scab counts with ammonium thiocyanate are explained by the later tuberization at which time conditions are less favourable for *A. scabies*.

G. R. Townsend and E. L. Felix (pp. 212–214) found that the most destructive virus diseases of celery during the year were southern celery mosaic [caused by a strain of cucumber mosaic virus: ibid., xv, p. 195], a second provisionally designated oak-leaf, and a third very similar to western celery mosaic [celery mosaic virus: ibid., xviii, p. 369]. Symptomatic and cross-inoculation studies showed that purslane (*Portulaca oleracea*) is a host for the second and third viruses, and that the oak-leaf condition, regarded by Wellman [ibid., xiv, p. 615] as a manifestation of southern celery mosaic, is a distinct disease. Oak-leaf symptoms are very like those of celery calico [ibid., xxv, p. 396], but the pattern is simple rather than intricate, and there are host differences. Pseudo-calico has not been fully described [ibid., xix, p. 60].

Reporting on the control of tobacco downy mildew [*Peronospora tabacina*: ibid., xxv, p. 237], R. R. Kincaid (p. 221) records that the only failure of fermate to give good commercial control of the disease was in a bed where it appeared late in February, and emphasizes the importance of summarily destroying old beds and of planting only new or steamed beds to reduce the danger of early infection. A 10 per cent. fermate dust plus 1 per cent. zinc sulphate gave control equivalent to the standard 20 per cent. fermate. Cool weather following the early trans-

plantings caused much mildew damage to lower leaves of cigar-wrapper tobacco. Later transplanted crops suffered little.

Castellani (E.). **Stato delle conoscenze micologiche e fitopatologiche per l'Eritrea, la Somalia e l'Etiopia.** [The state of mycological and phytopathological knowledge in Eritrea, Italian Somaliland, and Abyssinia.]—Reprinted from *Riv. Agric. subtrop. trop., 1945,* 1–12, 17 pp., [? 1946].

As circumstances have not yet made it possible to publish the first supplement to the list of plant diseases observed in 'Italian East Africa' [*R.A.M.*, xvii, p. 346], the writer has prepared this succinct review of the numbers and distribution of the fungal plant diseases and other fungi in these regions. There are now records of 897 species of fungi (including Myxomycetes), representing 303 genera [families only named with their distribution in six main areas], while the 76 host families [also listed] include 351 species in 234 genera. The work done by mycologists in each of the three countries is briefly indicated, and there is a bibliography of papers not listed in the earlier work [loc. cit.] or published since.

Braun (A. C.) & Elrod (R. P.). **Stages in the life history of Phytomonas tumefaciens.**—*J. Bact.*, lii, 6, pp. 695–702, 8 figs., 1946.

The stages in the life-history of the agent of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) were studied on Stapp and Bortels's special carrot media [*R.A.M.*, xi, p. 357] under the electron microscope, using the highly motile *Chry*[*santhemum frutescens*] II B strain. At the centres of a few of the star-shaped aggregates constituting one of the phases in the morphology of the organism [ibid., xxi, p. 444] was a chromatinic substance apparently representing a fusion of the Feulgen-positive material. This finding is highly suggestive of a simple form of sexuality in *Bact. tumefaciens*, but the authors feel that cytological studies alone are inadequate to afford a definite solution of the problem.

Draghetti (A.). **Natura genetico — morfologica — ambientale della resistenza del Frumento alle Puccinie sp.** [The genetic, morphological, and environmental nature of the resistance of Wheat to species of *Puccinia*.]—*Genet. agrar.*, i, 1, pp. 103–111, 1946. [Latin and English summaries.]

The author's observations on varietal resistance in wheat to rusts (*Puccinia* spp.) in relation to environmental and internal factors [*R.A.M.*, x, 367] confirm his previous finding that in the hot, dry parts of Italy all varieties show grade-1 resistance, whereas in cold, dry areas awned varieties show grade-1 resistance and awnless varieties grade-2. In cold, wet localities the loose-awned varieties are slightly susceptible and the compact-awned rather more so, while the loose awnless wheats are moderately, and the compact awnless definitely, susceptible. Under hot, wet conditions all varieties are more or less susceptible, though the awned varieties are less affected than the awnless, which are completely susceptible, particularly the compact-awnless.

The evidence indicated that under the conditions prevailing in northern Italy the lack of pigment in the epidermis of the leaves plays some part in the physiological resistance of certain wheat varieties, experiments having established that there was a direct correlation between the pigmentation of the tissue and transpiration and photosynthesis. In 1924, therefore, the author, in breeding experiments, tried to develop varieties with a completely colourless epidermis. The best Italian wheats, Rieti and Cologna, were used, and a variety of [*Triticum*] *albidum* obtained from the Far East. From one cross with Rieti he obtained two types of *T. albidum*, one awnless and one awned. When these were grown on a large scale, both showed an almost constant immunity from rusts, even in years when

Mentana and Villa Glori were heavily infected. Even in normal years these two *albidum* wheats were conspicuous for the small amount of dust they gave during threshing and their freedom from any fungal attack. In particular, they showed high resistance to *P. glumarum*. Observations on these two wheats from 1932 to 1945 lead the author to conclude that their resistance to rusts is largely due to the transparency of their green tissues, owing to the absence of other pigments. This allows solar radiation to pass more deeply into the mesophyll and to retard by actinic action the development of the mycelium. Both varieties, named, respectively, 'Mutina precoce aristato' and 'Mutina precoce mutico', are now being widely grown.

VOLOSKY YADLIN (DORA). **Nuevas razas fisiológicas de Puccinia triticina para Chile.** [New physiologic races of *Puccinia triticina* for Chile.]—*Agric. tec., Chile*, vi, 1, p. 67, 1946.

In addition to the five physiologic races of *Puccinia triticina* already recorded for Chile, viz., 15, 68, 71, 85, and 114 [*R.A.M.*, xxv, p. 158], two others have been observed, both on Klein Granadero wheat from Ovalle, namely, 66 in November, 1944, and 55 in September, 1945.

YERSIN (H.), CHOMETTE (A.), BAUMANN (G.), & LHOSTE (J.). **L'hexachlorobenzène produit organique de synthése utilisé dans la lutte contre la carie du Blé.** [Hexachlorobenzene, a synthetic organic product utilized in the control of Wheat bunt.]—Reprinted from *C.R. Acad. Agric. Fr., 1945*, 17th January, 3 pp., 1945.

Encouraging results having been secured in a preliminary test in 1942–3 in the control of wheat bunt [*Tilletia caries* and *T. foetida*] by seed-grain treatment with hexachlorobenzene, large-scale trials were conducted in two localities near Paris in 1943–4, using Arnaud and Gaudineau's methods of inoculation and calculation of the experimental data [*R.A.M.*, ix, p. 637].

At Argenteuil immersion of the seed for 20 minutes in solutions of hexachlorobenzene at concentrations of 0·02, 0·06, and 0·2 per cent. on 11th November resulted in the total elimination of infection, as also did the same treatment with 2 per cent. Bordeaux mixture, the incidence of bunt in control plants from untreated seed being 26·2 per cent. At Versailles the only treatment giving complete control was the 0·2 per cent. hexachlorobenzene, the amounts of infection in plants from seed treated with 0·06 and 0·02 per cent. being 1·8 and 2·3 per cent., respectively, and in those treated with Bordeaux mixture and the controls 0·4 and 23·4 per cent., respectively. Sprinkling with hexachlorobenzene at the rate of 100 gm. in 15 l. water per 100 kg. seed was completely efficacious in two out of three plots, the third showing a trace (0·2 per cent.) of bunt as compared with 11·8 per cent. in the untreated controls. The same treatment with 0·25 per cent. formalin was also successful. At Argenteuil dusting with hexachlorobenzene at a dosage of 200 gm. per 100 kg. seed gave complete control where the proportion of the active principle was 75 or 25 per cent., the 100 and 50 per cent. contents permitting traces of infection (0·4 and 0·15 per cent., respectively), while the amounts of bunt in the control plot and one treated with an organic mercury product were 26·2 and 0·15 per cent., respectively. At Versailles the incidence of infection in plants from similarly treated seed (100, 50, and 25 per cent. of the active ingredient) was 0·1, 0, and 0 per cent., respectively, control 23·4 per cent., and a copper oxychloride dust 0·1 per cent.

On the basis of these results hexachlorobenzene is considered to be a promising agricultural substitute for copper, and more especially for the poisonous organomercuric compounds with their grave risks to health.

Compton (L. E.) & Caldwell (R. M.). **Yield reductions by loose smut of Wheat.**—*Phytopathology*, xxxvi, 12, pp. 1040–1042, 1946.

The relation of the percentage of infection by wheat loose smut (*Ustilago tritici*) to yield reductions in the highly susceptible soft red varieties Purdue No. 1 and Wabash was investigated in 1941 and 1942 at the Indiana Agricultural Experiment Station. In both years a close correlation was established between the incidence of the disease, as measured by the percentage of infected heads, and the resultant losses, which amounted in Purdue No. 1 to 7·3 and 7·4 per cent., respectively, in 1941, and to 35·9 and 38·2, respectively, in 1942, the corresponding figures for Wabash being 13·2 and 13·4 per cent., respectively, in 1941, and 8·4 and 7·9, respectively, in 1942. No appreciable degree of infection by any other seed-borne disease was observed in the trial plots in either season, so the possibility of confusion in the interpretation of the data is considered to be remote. The authors' results are in agreement with those of H. M. Brown (*J. Amer. Soc. Agron.*, xxxvi, pp. 779–782, 1944) and with the conclusions drawn by Semeniuk and Ross from a comparable study on barley loose smut [*U. nuda*] in Canada [*R.A.M.*, xxii, p. 61].

Sarasola (J. A.), Favret (E. A.), & Vallega (J.). **Reacción de algunas Cebadas con respecto a 'Erysiphe graminis hordei' en Argentina.** [Reaction of some Barley varieties in regard to *Erysiphe graminis hordei* in Argentina.]—*Rev. argent. Agron.*, xiii, 4, pp. 256–276, 1946. [English summary.]

Erysiphe graminis is stated to be one of the most destructive pathogens on barley in Argentina, where information as to physiologic specialization within the fungus species [*R.A.M.*, xxv, pp. 31, 444] was lacking until the authors tested a large assortment of differential varieties with collections of the pathogen from various parts of the grain area. The results indicated that the country harbours only a single race, Arg. 1, differing from all others previously described. However, in a footnote added while this paper was in the press, the detection of a second physiologic race is reported. Among the more interesting responses of the varieties inoculated with Arg. 1 are the immunity of Monte Cristo C.I. 1017, West China, and Engledow India, the high resistance of Multaux Glabron 4884, Cebada Negra, Anoidium, and (slightly less) of Nigrate C.I. 2444, Lion × Palmella Blue 3877, and Gopal C.I. 1091; the resistance of Arlington Awnless C.I. 702 and Palmella Blue C.I. 3609; and the moderate resistance of *Hordeum distichum nigrinudum*, H. 541 (*H. polystichum nudum*), from Japan, and Importada Brugger (04)35.

Suneson (C. A.). **Effect of Barley stripe, Helminthosporium gramineum Rab., on yield.**—*J. Amer. Soc. Agron.*, xxxviii, 11, pp. 954–955, 1946.

Surveys conducted in California over the three-year period from 1943 to 1945 showed seed treatment and the cultivation of resistant varieties to be fairly effective in barley stripe (*Helminthosporium gramineum*) control [*R.A.M.*, xxii, p. 473], only one field in 25 showing more than 10 per cent. infection, though 20 per cent. harboured a trace or upwards. In paired tests in 1944 and 1945 with disease-free and stripe-inoculated seed of hybrids between a susceptible male-sterile strain (used as the female parent) and six genetically diverse pollen parents, viz., Vaughn, Trebi, Atlas, Rojo, Winter Tennessee, and Club Mariout, the aggregate yield reduction from the disease was apparently of the general order of 0·75 per cent. for each 1 per cent. infection. The mean values of the stripe-diseased plants, acre yield (in bushels), and percentage yield reduction from the fungus in the uninoculated and inoculated plots were 0 and 29, 106·3 and 81·3, and 0 and 22, respectively.

Apart from the practical application of these data to the estimation of stripe losses, they are of interest as suggesting that barley can make a 25 per cent. recovery in yield for deficient stand between heading and maturity.

Houston (B. R.) & Oswald (J. W.). **The effect of light and temperature on conidium production by Helminthosporium gramineum in culture.**—*Phytopathology*, xxxvi, 12, pp. 1049–1055, 1 fig., 1946.

At Davis, California, abundant normal sporulation of *Helminthosporium gramineum*, the agent of barley stripe, was obtained on potato dextrose agar cultures left outdoors for exposure to diurnal environmental changes. Under these conditions the conidia were produced on monoconidial isolations, mass mycelial transfers, and mycelial growth developing from fragments of diseased leaves placed on agar [*R.A.M.*, ii, p. 61]. Sporulation did not occur in the dark, either outdoors or in the laboratory, or under continuous high indoor temperatures in the light. A few conidia were produced under artificial light.

Relatively high temperatures and protracted exposure to light throughout the growing period resulted in excessively long conidiophores and sparse conidial production, both in culture and on pieces of diseased leaf. When the latter were incubated on agar in the dark at various points from 8° to 35° C., conidiophore length increased and that of the conidia decreased with rising temperatures. Thus, at 8° the length of the conidia ranged from 82·6 to 129 μ and at 18° from 62·4 to 96·8 μ, the corresponding average numbers of septa being 5·7 and 4·4 respectively.

Wager (V. A.). **Preliminary investigations on the black spot disease of Citrus.**—*Fmg S. Afr.*, xxi, 248, pp. 770–772, 2 figs., 1946.

In spite of exceptionally dry spring weather in 1945 and 1946 citrus black spot (*Phoma citricarpa*) [*R.A.M.*, xxiii, p. 175; xxiv, p. 128] continued to cause serious damage in many parts of South Africa. It was previously thought that the disease was confined to the mist-belt areas, but it is now considered likely that even in dry areas or dry seasons slight rains may be frequent enough to allow infection of the young fruit. The condition has now been found on oranges, lemons, grapefruit, and naartjies [mandarins] in numerous localities in Natal, Zululand, and the Transvaal. Experimental evidence showed that it can be prevented by spraying with commercial Bordeaux mixture (4–4–50) at petal-drop, with two further applications at intervals of six weeks. This treatment, however, is not recommended, owing to its deleterious effect on the leaves and fruit. Further work is in progress.

Ray (W. W.). **Cotton boll rots in Oklahoma.**—*Bull. Okla. agric. Exp. Sta.* B—300, 26 pp., 7 pl., 1 map, 1946.

While several fungi are associated with cotton boll rot and lint deterioration [*R.A.M.*, xxii, p. 479] in Oklahoma (a three-year survey in 34 counties showing *Alternaria* spp., *Aspergillus niger*, *Curvularia* spp., *Fusarium moniliforme* [*Gibberella fujikuroi*], *F.* spp., *Glomerella gossypii*, *Penicillium* spp., *Rhizopus nigricans* [*R. stolonifer*], and other fungi (including *Macrophomina phaseoli*) to be present, respectively, in 100, 28·6, 11·4, 52·9, 64·3, 5·7, 10, 14·3, and 18·6 per cent. of 70 samples), pathogenicity tests conclusively demonstrated them to be secondary invaders following boll injury due mainly to insect puncture or to bacterial blight (*Xanthomonas malvacearum*) [ibid., xxii, p. 386]. Blight lesions play an important part as the first step in the rot, since it is largely by means of them that the secondary fungi are enabled to enter the boll tissues. The bacterium is not important as a direct cause of the rot, as the lesions caused by it develop slowly, remain shallow, and often do not penetrate into the lint cavity.

As a result of inoculation experiments with the aforementioned fungi it was found that *R. stolonifer* and *A. niger* [ibid., vii, p. 96], separately, caused the most complete and rapid boll rot. *Gibberella fujikuroi* was only slightly less active. All, except *R. stolonifer* and *Glomerella gossypii*, produced more rapid deterioration

of the internal boll tissues than of the external. All the *Alternaria* spp. isolated were of the *A. tenuis* group, which is regarded as the most important cause of boll rot in Oklahoma. During the dry summer of 1943 *X. malvacearum* failed to develop, and boll-rotting was infrequent, but in the wetter seasons of 1942 and 1944 the bacterium was abundant, as were, subsequently, the boll-rotting fungi.

The key to the control of boll rots lies in the control of *X. malvacearum* [ibid., xxii, p. 386]. In 1944, in field tests with acid-delinted seed of the Deltapine 14 and Stoneville 2B varieties inoculated with a bacterial suspension, that treated with new improved ceresan showed no seedling infection as against 19·25 and 14·75 per cent., respectively, in the untreated. In 1945 greenhouse tests fuzzy Hi-Bred seed inoculated in the same way showed 0 to 1·4 per cent. seedling infection after treatment with new improved ceresan compared with 14·5 to 18·2 in the untreated. Work on the production of blight-resistant varieties has begun.

MARCHIONATTO (J. B.). **Un nuevo Cordyceps (Ascomicetos) sobre 'Araña Pollito'.** [A new *Cordyceps* (Ascomycetes) on the 'Chicken Spider'.]—*Physis, B. Aires*, xx, 55, pp. 16–18, 2 figs., 1945.

In October, 1944, the author received from the Department of Agricultural Zoology, Ministry of Agriculture, Buenos Aires, a specimen of the 'chicken spider' (Theraphosidae, Arachnidae) parasitized by a hitherto unknown fungus to which the name of *Cordyceps ignota* n.sp. is assigned. Its fructifications consist of a semi-erect, branched, glabrous, yellowish-white to purple stipe, 2 to 3 cm. in height; a clavate, curvulate, pruinose cap, 1 to 2 cm. in diameter; oval perithecia, 110 to 130 by 55 to 65 μ, provided with minute ostioles, immersed in the caespitose stromata developing on the ultimate segments of the legs; cylindrical, capitate, flexuous, hyaline asci, 72 to 82 by 5·5 to 6·5 μ, and linear, hyaline ascospores, 59 to 61 by 2 μ. The legs of the spider are inseparably united by the branches of the stipe.

LEPESME (P.). **Quelques mots sur les Laboulbéniales.** [Some remarks on the Laboulbeniales.]—*Entomologiste*, ii, 3, pp. 81–90, 10 figs., 1946.

The author briefly discusses the taxonomy and describes the morphology of the Laboulbeniales [cf. next abstract], with special reference to the species parasitic on Coleoptera in France.

ARWIDSSON (T.). **Om svenska Laboulbeniacéfynd.** [On Swedish finds of Laboulbeniaceae.]—*Svensk bot. Tidskr.*, xl, 3, pp. 307–309, 1 fig., 1946. [English summary.]

In collaboration with Dr. C. Lindroth the author obtained material of Laboulbeniaceae [see preceding abstract] from five Swedish provinces. Only two species, both of the genus *Laboulbenia*, have so far been closely investigated, namely, one on the beetle *Bradycellus collaris* from East Gothland and the other on *Harpalus melleti* from Gothland. The latter fungus did not infect all the species of *Harpalus* on which it was tested, but only those of the same subgenus (*Ophonus*). Soil contaminated by the spores was more effective in the spread and development of the pathogen than direct contact with infested insects.

WALKER (E. A.), JEHLE (R. A.), & JENKINS (ANNA E.). **Violet scab widely distributed in Maryland.**—*Plant Dis. Reptr*, xxx, 12, pp. 471–474, 1 map, 1946. [Mimeographed.]

Records recently obtained by the authors show that violet scab (*Sphaceloma violae*) [*R.A.M.*, xxiv, p. 192 and next abstract] is widely distributed on wild violets in Maryland. An intensive survey in Frederick County in 1945 showed the

disease to be very common, though violets growing at an altitude of over 1,000 ft. appeared unaffected, except in the Catoctin Mountain area near Foxville. At Lanham garden-grown *Viola striata* plants were affected.

When all the affected leaves were removed from sweet violets [*V. odorata*] in a heated frame in Rosaryville, the plants bloomed well during the winter, but lesions were found again in April on the blades and petioles of old yellowed leaves remaining on the plants; violets with the same history but in an open frame near by were entirely healthy, as were wild violets growing on the premises. On 12th July the disease was found in a greenhouse on the same site on white sweet violet plants obtained locally. Plants from the open cold frame had been transplanted near by and the disease was spreading to them from the white violets which were eventually almost destroyed by scab, though further spread on the blue violets was arrested by spraying.

JENKINS (ANNA E.). **Scab in a Violet collection in Virginia and some new records in other States.**—*Plant Dis. Reptr*, xxx, 12, pp. 475–476, 1946. [Mimeographed.]

Violets of at least 27 species and one variety [which are named] growing at Falls Church, Fairfax County, Virginia, were found in July, 1946, to be affected by scab (*Sphaceloma violae*) [see preceding abstract]. As all but two of the 24 North American species present were attacked, it would seem that these species growing wild in the Atlantic basin north of latitude 37° are liable to become affected. A search revealed affected wild violets along the Shenandoah River, West Virginia, and on the Skyline Drive, Virginia. In Delaware, a few infected plants were found growing as weeds at Bridgeville, Sussex County, apparently a first record for the State. By 1944 the disease had been recorded in all the coastal States from Massachusetts to Texas, except Delaware, and in 1945 it was found in Illinois. Repeated applications of Bordeaux mixture (4–2–50) gave satisfactory results at Falls Church.

WARE (ROMAINE B.). **Controlling blight of Lilies.**—*Horticulture*, xxiv, 11, p. 317, 1946.

In Oregon, where lilies are grown on a commercial scale, very satisfactory control of the destructive blight caused by *Botrytis* [*elliptica*: *R.A.M.*, xxv, p. 215] has been obtained by spraying with a mixture consisting of 1 lb. micronized copper, 4 oz. No. 101 Bordeaux spreader, and (for hard water) 1 oz. wetaline per 25 gals. water. Treatments should be given during the rainy period from April to June whenever temperatures approach 60° C., the optimum for infection.

ROSEN (H. R.). **Fungicides and insecticides used on garden Roses.**—*Amer. Rose Annu., 1946*, pp. 168–174, 1946.

Five tables are given, showing (i) in alphabetical order the trade names, active ingredients, and purposes of fungicides used to control parasitic diseases and insect pests on roses; (ii) standard or common fungicides used to control black spot [*Diplocarpon rosae*], powdery mildew [*Sphaerotheca pannosa*], and other diseases; (iii) standard or common insecticides; (iv) insoluble or 'fixed' coppers for the control of the above-mentioned diseases; and (v) new organic fungicides and insecticides and their chemical composition.

VIENNOT-BOURGIN (G.). **À propos d'un Oidium des feuilles de Lilas.** [On an *Oidium* affecting Lilac leaves.]—*Rev. Mycologie*, N.S., ix, 4–6, pp. 75–77, 1944. [Received October, 1946.]

For some years past lilac growing in clumps near Paris has been affected by a mildew. Infection begins in September, is very active during the first half of

October, and persists until the leaves fall. Those facing north and in the shade are most affected. The fungus at first develops on the upper surface of the blade as diffuse, arachnoid, isolated, or confluent white spots which gradually become greyish. On the lower surface they are less numerous and less easily visible.

Usually only the conidial stage was present, the erect conidiophores bearing one, or occasionally two, terminal conidia. In October, 1945, material bore pale-yellow, orange, or dark brown perithecia in different stages of maturity on the lower leaf surfaces only. The spherical perithecia measured 150 to 300 μ in diameter, and had a wall 15 to 20 μ thick. On the surface of conceptacles were 5 to 18 hyaline, rigid, acuminate appendages, swollen at the base. The fungus clearly answered to the description of *Phyllactinia corylea* [*R.A.M.*, xiii, p. 127; xix, pp. 309, 330]. Mature asci were not observed.

KUHNHOLTZ-LORDAT (M.). **Notes de pathologie végétale.** [Plant pathological notes.]—*Ann. Épiphyt*, N.S., xii, 1, pp. 41–43, 1 fig., 1946.

In this further series of plant pathological notes [cf. *R.A.M.*, xxv, p. 381] the author states that in the vicinity of Montpellier leaf spot infection of *Photinia serrulata* is of the type of [*Phyllosticta*] *photinicola*. The pycnidia range from 128 to 140 μ in diameter and the ovoid conidia measure 5 to 6 by 3·5 μ. The spots are greyish-white, with a narrow purple border, and may have an area of 1 sq. cm.

POHJAKALLIO (O.). **Untersuchungen über den Kleekrebs und seinen Anteil am Verschwinden des Klees in Kleegrasgemischen.** [Studies on Clover rot and its share in the disappearance of the Clover in Clover-grass mixtures.]—*Pflanzenbau*, xvi, 4, pp. 136–160; 5, pp. 201–205, 9 figs., 1 diag., 1939. [Received January, 1947.]

Sclerotinia trifoliorum constitutes the chief threat to clover cultivation in Finland [*R.A.M.*, xxvi, p. 10], where it often partially or wholly decimates the crop in some localities. In most of the years covered by the writer's investigations (1933 to 1938) alsike clover (*Trifolium hybridum*) was more susceptible than red (*T. pratense*), while the best native strains of the latter were more resistant than those of foreign origin, though not sufficiently so to avert losses of more than half the crop in seasons of severe epidemics. In pot inoculation experiments on various clover strains with pure cultures of the fungus no differences in reaction were perceptible, all being almost totally destroyed.

Several isolates of *S. trifoliorum* differed in their morphological and biological characters. For instance, a strain isolated from red clover (one from white clover resembled it closely) at Jokioinen, where the disease occurs in an extremely acute form, was strongly pathogenic to the various clovers, lucerne, *Lotus corniculatus*, *Myosotis arvensis*, *Thlaspi arvense*, *Chenopodium album*, and *Cirsium arvense*. Sclerotia was formed along the edge of the Petri dish on Henneberg agar.

The pathogenicity of strain 'Tammisto A', isolated from red clover leaves from the Tammisto Plant Breeding Institute, was comparatively mild. Like the foregoing, it formed sclerotia predominantly at the periphery of the culture; the growth rate of its very sparse mycelium was slower than that of the other isolates. A strain procured from Leipzig, Germany, approximated to 'Tammisto A' in pathogenicity to red clover and *L. corniculatus*. On Henneberg agar the sclerotia were almost uniformly distributed over the surface. A strain from *T. arvense* was feebly pathogenic to its own host and red clover. On sterilized potato it formed a dense mycelium and a considerable number of generally rather small and much-flattened sclerotia. A mixture of the Jokioinen, 'Tammisto A', and Leipzig isolates, grown on tomato fruits, was strongly pathogenic to the variou sclovers.

The fact that *S. trifoliorum* is strongly aerobic is believed to account for the observed variations in the extent of the damage in the open. Thus, in one meadow

covering several hectares, only about 1 per cent. of the red clover at the bottom of several water-furrows had been killed, compared with 90 to 99 per cent. for the rest of the field.

Differences in manurial practice or inoculation with nodule bacteria were without effect on the damage caused by clover rot, resistance to which in the new growth was weakened by mowing the stubble right down to the ground in September.

In addition to *S. trifoliorum*, two other strains of uncertain identity were studied in the laboratory. One, isolated from wax bean (*Phaseolus*) [*vulgaris*], formed abundant mycelium but few sclerotia on Henneberg agar; it was highly pathogenic to *T. arvense, Chenopodium album, Trifolium medium, M. arvensis* (completely destroyed), fairly so to red clover, and caused 20 to 38 per cent. infection on *L. corniculatus*. The other, designated 'Tammisto B', was isolated from the sixth subculture of 'Tammisto A', from which it differed in the size, shape, and slow growth of its sclerotia, and in its abundant mycelial development. In pathogenicity to the test plants it resembled the parent strain. The sclerotia of 'Tammisto B' approximate closely to those of *S. minor* as described by Chivers [ibid., viii, p. 607], in which connexion it is recalled that Valleau *et al.* regard *S. minor* as identical with *S. trifoliorum* [ibid., xiii, p. 241].

JONES (F. R.) & TORRIE (J. H.). **Systemic infection of downy mildew in Soybean and Alfalfa.**—*Phytopathology*, xxxvi, 12, pp. 1057–1059, 1 fig., 1946.

Downy mildew (*Peronospora manshurica*) developed about mid-June, 1945, at the Wisconsin Agricultural Experiment Station, and before the end of the summer the entire soy-bean nursery was involved. In the more susceptible varieties, e.g., Richland and Illini, many pods bore seed encrusted with the oospores of the fungus, as described by Johnson and Lefebvre [*R.A.M.*, xxi, p. 361]. Planted in the greenhouse, such seed at times gave rise to seedlings with lesions apparently connected by mycelium in a systemic infection, and similar material was collected in the field by W. B. Allington and others. The development of spore encrustations on the seed was correlated with the size of the foliar lesions, the former being conspicuously in evidence where the latter were large, and occasional or virtually absent in plants with small spots or none. Seed yield did not appear to be reduced by the disease.

Nursery lucerne also suffered from downy mildew (*P. trifoliorum*) [ibid., xxi, p. 22; xxiv, p. 62] in the same season, the percentage of infection ranging from 12 per cent. in Hardistan and Ladak to 60 per cent. in Hardigan. Individual plants and clones varied in their reaction to the fungus, which was usually confined to the leaves, though occasionally systemic. Conidia produced in April, 1946, on overwintered crown shoots of systemically infected plants are believed to have been the source of a severe outbreak of the disease in May. In selfed populations over half the progeny of susceptible parents were similarly diseased, with a few cases of systemic infection.

STEVENSON (J. A.). **Powdery mildew of Mesquite.**—*Plant Dis. Reptr*, xxix, 8, pp. 214–215, 1945. [Mimeographed. Received January, 1947.]

Mesquite (*Prosopis chilensis*) growing in Texas and the adjoining part of Mexico is commonly affected by powdery mildew, caused by *Leveillula taurica* [*R.A.M.*, xviii, p. 83; xxiv, p. 343].

KATZNELSON (H.). **The 'rhizosphere effect' of Mangels on certain groups of soil microorganisms.**—*Soil Sci.*, lxii, 5, pp. 343–354, 6 graphs, 1946.

At the Department of Agriculture, Ottawa, Canada, mangel roots were found to exert a marked selective action on various groups of micro-organisms in both

manured and unfertilized soils [cf. *R.A.M.*, xxii, p. 497]. Thus, in the former the rhizosphere: control soil ratios of *Actinomyces* spp. and fungi after 80, 117, and 142 days' growth were 3, 23, and 30, and 2·5, 6, and 3, respectively, the corresponding figures for the latter being 2, 23, and 6, and 2·5, 19, and 5, respectively.

FISCHER (A.). **Über einige Krankheiten an Obstbäumen.** [On some fruit tree diseases.]—*Schweiz. Z. Obst- u. Weinb.*, lv, 26, pp. 495–502, 4 figs., 1946.

Notes are given on some diseases of fruit trees which assumed unusual prominence in Switzerland during 1946. Isolations from rotted apple buds yielded various organisms, including *Fusarium lateritium* [*R.A.M.*, xvi, p. 18; cf. also ibid., xxi, p. 3]. Apple mildew (*Podosphaera leucotricha*), favoured by the dry spring, caused heavy damage in some localities, and its control presents great difficulties. The application of sulphur sprays to the buds containing the overwintering mycelium has not proved effective, and the excision and burning of infected branches is impracticable, especially on large trees. Landsberger Reinette is the most susceptible variety; immunity from the disease is unknown.

Phytophthora omnivora [*P. cactorum*] induced a purple-brown discoloration of pear fruits [ibid., xv, p. 555; xxi, p. 531], on the surface of which the white mycelium developed under persistently humid conditions. The pathogen overwinters in the soil and hence primarily affects the fruits on the lower branches. Post-blossom sprays are the most important in the prophylaxis of the rot. Diseased fruits should be collected and destroyed.

Cylindrosporium padi [ibid., iii, p. 724] is reported to have been prevalent on nursery cherry trees, inducing the formation on the leaves of dark red-brown, diffuse, often coalescent, persistent lesions and premature defoliation.

Spraying experiments in the canton of Ticino showed that peach shot-hole (*Clasterosporium carpophilum*) and scab (*Venturia cerasi*) [ibid., vii, p. 557] may be effectively combated by summer treatments with the organic fungicides, grisard, organol, and pomarsol [ibid., xxii, p. 314 *et passim*], which are innocuous to the very sensitive foliage. Preventive pre-blossom 'reserve' sprays of Bordeaux mixture or copper oxychloride should also be given [cf. next abstract].

BLUMER (S.), BIERI (F.), & LÜTHI (E.). **Die kombinierte Spritzung beim Kernobst.** [The combined spraying of pome fruits.]—*Schweiz. Z. Obst- u. Weinb.*, lv, 26, pp. 503–506, 1946.

A tabulated account is given of experiments in three localities of Switzerland in 1946 to determine the value against apple scab [*Venturia inaequalis*] and insect pests of a combined spray of Bordeaux mixture or copper oxychloride [*R.A.M.*, xxii, p. 314] with emulsified fruit tree carbolineum or dinitrocresol given from 23rd to 29th March. On the Bohn variety the average percentage of infection on trees sprayed with (1) 4 per cent. Bordeaux was 6·5, (2) 2 per cent. copper oxychloride, 16·6, (3) 4 per cent. Bordeaux plus 6 per cent. carbolineum, 5·9, (4) 2 per cent. copper oxychloride plus 6 per cent. carbolineum, 14·1, (5) 4 per cent. Bordeaux plus 2 per cent. dinitrocresol, 10·6, and (6) 2 per cent. copper oxychloride plus 2 per cent. dinitrocresol, 18, compared with 35·2 on the controls. The average incidence of scab on five varieties (Bohn, Boskoop, Boiken, Sauergrauech, and Golden Pearmain) sprayed with (1) Bordeaux alone was 6·9 per cent., (2) the same plus carbolineum, 7·7, (3) the same plus dinitrocresol, 11·2, (4) copper oxychloride alone, 14·9, the same plus carbolineum, 15·7, the same plus dinitrocresol, 15, and untreated 36·8.

Further trials are necessary to elucidate various points connected with the relative merits of the two fungicides in combined treatments, but the definite and persistent protection conferred by the combined spray emerges clearly from these preliminary tests.

SACCAS (A.). **Étude morphologique et biologique des Fusicladium des Rosacées.** [A morphological and biological study of the species of *Fusicladium* affecting the Rosaceae.]—317 pp., 2 pl., 59 figs., 5 graphs, Paris, Librairie Le François, 1944 (published 1945). [Received September, 1946.]

The results are fully described of a comparative study of the morphology, histology, and biology of the mycelium, conidiophores, and conidia, both on the host and in culture, of *Fusicladium dendriticum* (*Venturia inaequalis*), *F. pirinum* (*V. pirina*) and *F.* [*pirinum* var.] *pyracanthae* [*R.A.M.*, xxiii, p. 346] on apple, pear, and *Crataegus pyracantha* [*Pyracantha coccinea*], respectively.

The development and release of the conidia under various conditions were studied both on the host and in culture. The conidial measurements of *V. pirina* on the host leaves, branches, and fruit were, respectively, 22·5 by 7·25, 25·3 by 7·7, and 24·3 by 7·25 μ, the corresponding figures for *V. inaequalis* being 20·76 by 7·63, 21·98 by 8·01, and 21·64 by 8·4 μ, and for *F. pirinum* var. *pyracanthae* 16·64 by 8·29, 17·97 by 8, and 17·52 by 8·51 μ.

The conidia of *V. pirina* were usually unicellular, only 3 to 20 per cent. being bicellular; of *F. pirinum* var. *pyracanthae* 10 to 25 per cent. and of *V. inaequalis* 14 to 60 per cent. were bicellular.

At a constant humidity the minimum, optimum, and maximum temperatures for conidial germination were, respectively, 1°, 20°, and 33° C. for *V. pirina,* 1°, 18°, and 32° for *V. inaequalis,* and 2°, 22°, and 35° for *F. pirinum* var. *pyracanthae.* At 40° the conidia of all three species were killed after 24 to 48 hours in a saturated atmosphere.

Rapidity of germination was proportional to temperature, while percentage of germination was inversely proportional to it. Young conidia germinated more rapidly than older ones. The best medium for germination was water, and germination was more rapid when the conidia were in contact with young leaves than with branches. Dry conditions reduced germination, and no conidia germinated at 50 to 60 per cent. humidity. The number of conidial germ-tubes varied with the species: with *V. pirina* there were 28 to 40 per cent. with one tube, 45 to 70 with two tubes, and 3 to 18 with three; with *V. inaequalis* the corresponding figures were 60 to 90, 10 to 37, and 3 to 5, while with *F. pirinum* var. *pyracanthae* they were 90, 8, and 2, respectively.

The conidia of all three species were highly resistant to cold; when kept at −5° for 150 days or −10° for one month they showed no appreciable reduction in viability, but germinated actively and in higher proportions than conidia not subjected to low temperatures. They were also found to remain viable for at least a year if kept dry. The mycelium in the aerial parts of the host releases conidia from February, or earlier, onwards. In culture (under identical conditions) the colonies of *V. pirina* were violaceous-grey on the surface and olivaceous-black in the medium; those of *V. inaequalis,* deep black below, were covered with an orange-yellow felt, while those of *F. pirinum* var. *pyracanthae* were bluish-green on the surface and olivaceous-black below. Sporulation in culture occurred after six days with *V. pirina,* 10 to 13 with *V. inaequalis,* and 15 to 20 with *F. pirinum* var. *pyracanthae.*

BROWN (I. L.). **Curing deficiency of boron in fruit trees.**—*N.Z.J. Agric.,* lxxiii, 5, p. 456, 1946.

In 1934, Sturmer apple trees in an orchard in Central Otago, New Zealand, producing only 25 per cent. saleable fruit owing to boron deficiency [*R.A.M.*, xxvi, p. 64], were sprayed with the usual spring sprays to which borax was added at the rate of 2 lb. per 100 gals., an application being made three weeks after the calyx spray, and another at the same strength three weeks later. Great improvement in the quality of the crop resulted, almost all the apples being marketed.

Jonathan trees similarly treated also improved. The applications were continued annually at the same rate until 1939, when the amount of borax used was reduced to 1 lb. The treatment has since been extended to all pip and stone fruits in the orchard, with excellent results.

HALLER (M. H.) & BATJER (L. P.). **Storage quality of Apples in relation to soil applications of boron.**—*J. agric. Res.*, lxxiii, 6, pp. 243–253, 1 fig., 1 graph, 1946.

As a result of further observations, extended to 1944, of their experiments on the effect of borax soil treatments on the boron content and storage qualities of apples [cf. *R.A.M.*, xxi, p. 529; xxii, p. 437], the authors consider it doubtful that maturity is advanced by these treatments because, although earlier colouring and dropping occur, changes in dessert quality are not advanced. Analyses of fruit showed that the boron content decreases slowly year by year if no further applications are made, but after three or four years it is still considerably higher than that of the controls.

The Jonathan variety was found to be very susceptible to boron injury, internal breakdown of fruit occurring if the boron content rose above 30 to 40 p.p.m. Borax applications to this variety are not recommended unless there is a definite deficiency and even so care must be taken not to apply excess. Rome Beauty also showed slight susceptibility, whereas Grimes Golden, Delicious, and York Imperial not only tolerated up to 2 lb. per tree but showed reduced scald as a result.

MOORE (M. H.). **Bacterial canker and leaf spot of Plum and Cherry. A summary of present knowledge on control measures in Britain.**—*Rep. E. Malling Res. Sta., 1945*, pp. 134–137, 1946.

In this paper compiled from memoranda prepared by the author in association with H. B. S. MONTGOMERY, H. E. CROXALL, and R. W. MARSH the present state of knowledge regarding the control of bacterial canker of plums (*Pseudomonas mors-prunorum*) and cherries (*P. mors-prunorum* and *P. prunicola*) [*R.A.M.*, xviii, p. 689; xxiv, pp. 155, 323, 454] in Britain is briefly reviewed and discussed. The most promising methods of control on plum appear to be the use of a resistant framework [ibid., xxi, p. 25] and foliage spraying during summer with a copper-containing bactericide [cf. ibid., xxvi, p. 18]. With cherry, frameworking is also promising, but very good results have been obtained by spraying with home-made Bordeaux-mixture at 10–15–100 in autumn and 6–9–100 in spring.

HARRIS (R. V.). **Plant pathology.**—*Rep. E. Malling Res. Sta., 1945*, pp. 32–35, 1946.

This report [cf. *R.A.M.*, xxv, p. 125] contains, *inter alia*, the following items of interest. A severe attack of raspberry cane blight (*Leptosphaeria coniothyrium*) [ibid., xxiii, p. 234] associated with heavy infestation by the midge *Thomasiniana theobaldi* occurred on new seedling varieties. Direct inoculations of wounded and unwounded canes to compare the action of the fungus with that of other fungi commonly associated with the lesions indicated that some of the latter are also contributory agents as wound parasites. Promising results in control were given by insecticidal treatment. Further work is in progress. Of five raspberry seedlings tested by grafting, four were tolerant of Lloyd George mosaic (mosaic 1 plus mosaic 2) [cf. ibid., xix, p. 293; xxiv, p. 137]. Of two new virus-free seedlings one was sensitive to mosaic 2 and the other tolerant. Norfolk Giant was useful as an indicator to supplement results obtained with Baumforth's Seedling B in grafting tests.

Parallel experiments in Scotland in conjunction with those at East Malling led to the identification of five distinct types of symptom of raspberry virus disease,

some of which appeared to originate from multiple viruses. All these viruses occur in current Scottish stocks of Lloyd George, three being 'carried' without diagnostic symptoms. This widely grown variety is the main source of trouble in this connexion in the Strathmore raspberry-growing area. It was ascertained that leaf curl [loc. cit.], not yet reported south of the Border, is highly sensitive to climatic factors.

Promising results were obtained in the joint control by spraying of raspberry cane spot [*Elsinoe veneta*: ibid., xviii, p. 325] and raspberry moth (red bud borer).

Grubb (N. H.). **Malling Promise Raspberry.**—*Rep. E. Malling Res. Sta., 1945*, p. 133, 1946.

The new raspberry variety, Malling Promise, has not yet shown any symptoms of mosaic. Observations and small-scale tests indicate that it is highly resistant to natural infection and suggest that most of the cane in circulation is virus-free. Artificially infected, Malling Promise is tolerant towards mosaic 2 [*R.A.M.*, xix, p. 293], though it displays mosaic symptoms when graft-infected with certain combinations of viruses.

Jenkins (Anna E.) & Shear (C. L.). **Gloeosporium venetum and G. necator: two distinct species on Rubus.**—*Phytopathology*, xxxvi, 12, pp. 1043–1048, 1 fig., 1946.

This is an expanded account and discussion of the authors' taxonomic studies on *Gloeosporium venetum* and *G. necator*, a note on which has already been published [*R.A.M.*, xxiii, p. 181]. *G. venetum* is tentatively relegated to synonymy with *Phyllosticta fuscozonata* Thüm. on raspberry in Italy, while *G. necator* is transferred to *Sphaceloma* as *S. necator* (Ell. & Ev.) n.comb. This change does not affect the name of the perfect state, *Elsinoe veneta* (Burkh.) Jenk. (*Plectodiscella veneta* Burkh.) [ibid., xi, p. 724]. The name *G. venetum* as used by American authors refers to *S. necator*.

Reichert (I.) & Palti (J.). **Cycloconium leaf spot of Olives.**—*Hassadeh*, xxvi, pp. 451–452, 1 fig., 1946. [Hebrew.]

The distribution of olive leaf spot (*Cycloconium oleaginum*) [*R.A.M.*, xxiv, p. 24] in Palestine is largely restricted to the coastal plain and the western valley of Esdraelon, though it has also been reported from the western region of Upper Galilee and Samaria, the southern shore of Lake Tiberias, and in Jerusalem. In the coastal plain the first symptoms usually appear in June to July on the previous season's growth, and the development of the fungus seems to continue throughout the autumn and winter. The disease is rife in irrigated groves, on the northern and western slopes, and on the corresponding aspects of individual trees, i.e., where the humidity is higher. The so-called 'Syrian' variety of mixed origin is very prone to infection by *C. oleaginum* and Merchavia is also susceptible, while Ascolano and Mansanillo are less so. Control should be based on the cultivation of resistant varieties in localities favouring the pathogen, supplemented in irrigated groves by spraying with 1 per cent. Bordeaux mixture or 0·3 per cent. perenox, the first treatment being given in late June or early July, the second in September or October, and the third (for very susceptible varieties only) in January.

Meredith (C. H.). **Soil Actinomycetes applied to Banana plants in the field.**—*Phytopathology*, xxxvi, 12, pp. 983–987, 1946.

Significant differences in growth measurements were observed at the Orange River Experiment Station, Jamaica, between banana plants on plots treated with

Actinomycetes of varying degrees of antagonism to *Fusarium oxysporum* var. *cubense* and those grown without such treatment [*R.A.M.*, xxiii, p. 447]. The application of 'antagonistic' and 'slightly antagonistic' Actinomycetes to the soils from which they were isolated resulted in larger growth increases in banana plants than did that of 'very antagonistic' organisms from other soils, but plots treated with the latter produced fewer infected plants than those to which 'antagonistic' and 'slightly antagonistic' Orange River Actinomycetes were added. Mulching failed to stimulate the growth of the plants.

CIFERRI (R.) & BALDACCI (E.). **Mancata azione antagonista di un sale di zinco sulla fungistaticità dell' 8. idrossichinolina.** [Failure of the antagonistic action of a zinc salt on the fungistatic ability of 8-hydroxyquinoline.]—*Farmaco*, i, 4, pp. 250–253, 1 graph, 1946. [English summary.]

Laboratory experiments showed that, contrary to the results obtained by Zentmyer with other organisms, the addition of zinc sulphate did not inhibit the fungistatic effect of 8-hydroxyquinoline towards *Alternaria tenuis*, *Fusarium oxysporum*, *F. moniliforme* [*Gibberella fujikuroi*], *F. solani*, and *Penicillium notatum*. A re-examination of earlier data [*R.A.M.*, xxv, p. 224] supported these results, and indicated that the probably active interrelation between zinc sulphate and 8-hydroxyquinoline is different from that between the latter and copper sulphate, which is reciprocally potentializing. Graphical analysis of the data suggested that varied reciprocally potentializing effects between the zinc salts and the oxyquinoline were due to the formation of zinc-oxyquinoline compounds which showed differential toxicity to *A. tenuis* spores.

TUNBLAD (B.). **Kemiska bekämpningsmedel i lantbrukets tjänst.** [Chemical control methods in the service of agriculture.]—*K. LandbrAkad. Handl., Stockh.*, lxxxiv, 4, pp. 245–258, 1945. [German summary.]

In this review of the present position as regards chemical disinfection for plant pest and disease control in Sweden it is stated, *inter alia*, that large-scale cereal seed-grain treatment against fungal pathogens is carried out exclusively by means of mercurial dusts, frequently combined of recent years with an oil solvent [*R.A.M.*, xxv, p. 207].

TRIKOJUS (V. M.). **Chemistry of sodium ethylmercurithiosalicylate.**—*Nature, Lond.*, clviii, 4014, pp. 472–473, 1946.

The preparation and properties of sodium ethylmercurithiosalicylate [merthiolate: *R.A.M.*, xxvi, p. 71] and its methyl and butyl derivatives are described. The fungistatic and fungicidal action of the sodium salt is uncertain. As it decomposes in aqueous solution it is thought that access of water vapour, which also provides conditions for fungal growth, might favour a similar breakdown of the mercurial when incorporated with lacquer, and possibly a further decomposition to more volatile substances.

In a comment on this and the paper by Turner *et al.* [loc. cit.], J. W. J. FAY, of the Ministry of Supply, London, points out that, with the improvement of sealing and packaging, and, if necessary, the use of a desiccating agent, the need to consider a fungicide in designing new optical instruments is eliminated. Samples of the Australian lacquer are being awaited for test in order to determine how far the danger of corrosion, which accompanies the decomposition of merthiolate in the presence of moisture, has been obviated. While evidence of the superiority of the new Australian method over the older treatments is afforded by the results, it is not clear, in the absence of true controls, how far the improvement is attributable to the use of the fungicide.

Norris (D. O.). **Recent advances in plant protectant fungicides.**—*Aust. J. Sci.*, ix, 1, pp. 1–6, 1946.

This survey of recent important developments in the production of plant-protective fungicides is a revision of a paper presented at the second meeting of the Inter-Divisional Committee on Toxicology, C.S.I.R., held at Canberra in July, 1945. Reference to all the studies included in the bibliography has been made from time to time in this *Review*.

Hansen (H. N.) & Snyder (W. C.). **Inheritance of sex in fungi.**—*Proc. nat. Acad. Sci., Wash.*, xxxii, 10, pp. 272–273, 1946.

Continuing their earlier studies [*R.A.M.*, xxii, p. 490], the authors obtained another mutant of *Hypomyces solani* f. *cucurbitae* identical with the normal hermaphrodite in the production of microconidia, macroconidia, and perithecial primordia, and in its ability to become fertilized by conidia from the opposite compatibility group, but differing in that its parts are unable to act as fertilizing elements. This isolate is considered to be a female and when it is mated with an hermaphrodite strain the progeny are in the ratio of one female to one hermaphrodite. It was presumed that the factors for male and female would be alleles and when crossed should produce male and female strains in equal numbers. However, when 200 ascospores from that cross were grown, the mycelia produced were: 84 female, 64 male, 24 hermaphrodite, and 28 neuter, these last producing macro- and microconidia but being unable to function as male or female.

These results indicate that the male and female factors occupy loci some distance apart in homologous chromosomes, and that crossing-over occurs, resulting in the appearance of neuters and hermaphrodites.

Hunt (N. R.). **Destructive plant diseases not yet established in North America.**—*Bot. Rev.*, xii, 10, pp. 593–627, 1946.

Notes (with numerous references to the bibliography of 170 titles) are given on a number of fungal, bacterial, and virus diseases of plants not yet established in North America, though known to be destructive elsewhere. Introductory sections review the criteria for the evaluation of destructiveness of plant diseases, factors affecting such destructiveness (virulence of pathogen, susceptibility of host, reproductive capacity of pathogen, ability of pathogen to spread or reach its host, ability of pathogen to survive, ecological conditions as related to host and pathogen, and difficulty of control), and potential sources of destructive foreign diseases. The paper terminates with a general discussion on the possible channels of entry and recommendations for meeting the danger.

Dexter (R. W.). **The Eelgrass situation in the Annisquam (Massachusetts) and Mystic (Connecticut) tidewater rivers in the summer of 1946.**—*Plant Dis. Reptr*, xxx, 11, pp. 424–425, 1946. [Mimeographed.]

During the summer of 1946 a considerable and significant increase in the abundance and spread of eelgrass (*Zostera marina*) was observed in certain areas of the Annisquam River at Gloucester, Massachusetts, and of the Mystic River at Mystic, Connecticut. The eelgrass disease [? *Labyrinthula macrocystis*: *R.A.M.*, xxiv, p. 377] was still prevalent, but *Z. marina* had more than doubled its growth in one year.

Savile (D. B. O.). **A rapid freehand sectioning method for leaves.**—*Stain Tech.*, xxi, 3, pp. 99–102, 2 figs., 1946.

A description is given of a rapid sectioning method by which a diseased piece of leaf is soaked in lactophenol on a slide and sections are sliced off under the dissect-

ing microscope with a diagonal scalpel having a slightly curved blade. Unsatisfactory sections can be discarded immediately, and it is usually possible to see which sections contain the fruiting bodies of a fungus.

WAGNER (R. P.), WEBBER (H. H.), & SIU (R. G. H.). **The effect of ultraviolet light on Cotton cellulose and its influence on subsequent degradation by microorganisms.**—*Arch. Biochem., N.Y.*, xii, 1, pp. 35–50, 1 diag., 2 graphs, 1947.

The Pressley Index of tensile strength of cotton fibres (*Bull. Amer. Soc. Test. Mater.*, cxviii, p. 13, 1942) served as a useful and convenient measure of the effect of ultra-violet irradiation and the action of *Metarrhizium glutinosum* on cotton fibres [*R.A.M.*, xxv, p. 515] in this co-operative study reported from the Research Division, National Cotton Council of America, University of Texas, and the Biological Laboratories, U.S. Army Quartermaster Corps, Philadelphia. Using this method, the loss of tensile strength from ultra-violet irradiation was shown to be independent of oxygen concentration and humidity, but positively correlated with ultra-violet light intensity and temperature. The reduction in fibre tensile strength amounted to approximately 20 per cent. after four hours' exposure to ultra-violet irradiation of an intensity of 1,060 microwatts per sq. cm. Iron and manganese salts catalyse the deleterious effect of ultra-violet light on cotton cellulose.

The exposure of cotton fibres to ultra-violet rays increases their resistance to subsequent infection by *M. glutinosum*. During the first four days of fungal growth the average rate of deterioration of the unirradiated fibres was twice that of irradiated. There was no difference in the rate of fungal attack on fibres irradiated for the same period and with the same light intensity, but with varying oxygen concentrations and relative humidities.

ROMANO (F. R.). **The effect of nitrogen on the growth of Chaetomium globosum on Cotton canvas.**—*Amer. Dyest. Reptr*, xxxv, 15, pp. 363–364, 375–376, 2 figs., 1 graph, 1946.

The nitrogen concentration of the nutrient media in general use was found to be insufficient for the maximum growth of *Chaetomium globosum* on untreated cotton canvas [*R.A.M.*, xxv, p. 515], and in experiments at the Industrial Test Laboratory, Philadelphia Naval Base, a definite increase in the development of the mould was secured by the addition of ammonium nitrate at the rate of 1·4 to 1·75 gm. per l., while concentrations up to 7·35 gm. were not inhibitory. The fact that nitrogen was the limiting factor in the growth of the fungus was demonstrated by a supplementary test confirming the adequacy of the other ingredients of the inorganic nutrient solution. A high-nitrogen medium appears to increase the amount of cellulose deteriorated per unit time, and is also more effective than the unfortified substratum in the elimination of doubtfully efficient mildew-preventive treatments, thereby minimizing service failures.

Development of mildew-resisting Cotton in the U.S.A.—*Cotton, Manchr*, 25th August, 1945. [Abs. in *Emp. Cott. Gr. Rev.*, xxiii, 1, p. 69, 1946.]

A new type of cotton yarn, known as 'acetylated' and made by a process comparable to that used in the manufacture of rayon, has been developed in the Southern Regional Research Laboratory, New Orleans. It has the strength and appearance of ordinary cotton, but is highly resistant to mildew and other agencies of decay, remaining almost unaffected by soil burial for six months to a year under conditions causing the disintegration of ordinary cotton in a week. It is intact after two years' weathering. Potato bags made of the new material are not harmed

by the presence inside of spoiled potatoes. Freedom from toxic substances is a further advantage in the usage of the bags for food.

LESTER SMITH (E.). **British penicillin production.**—*J. Soc. chem. Ind., Lond.*, lxv, 10, pp. 308–313, 1946.

Several pilot and production units for penicillin were erected in Great Britain during the war. The vessels used consisted mostly of milk bottles or special flasks, and the successive operations of washing, filling, autoclaving, inoculating, incubating, and harvesting were usually mechanized. Surface-culture methods could not compete with the submerged-culture processes developed in the United States and now installed in two large British factories, since a single tank may be equivalent to 500,000 milk bottles. The penicillin is concentrated and purified by adsorption or partition processes and the final solution is freeze-dried to enhance its stability. British monthly production figures, lately released, compare as follows with American (in mega units): 1943, 300 and 1,700, respectively; 1944, 3,200 and 138,000; 1945, 26,000 and 570,000; and present (May, 1946), 260,000 and 800,000 (approximately).

A discussion of this paper, read before the London Section of the Society of Chemical Industry on 6th May, 1946, is reported on pp. 313–314.

PILCHER (K. S.). **Biological and biochemical factors in penicillin production.**—Abs. in *J. Bact.*, lii, 6, p. 71, 1946.

None of the biological factors influencing the penicillin yield produced by fermentation is more important than the inherent capacity of the strain of mould used for the secretion of the antibiotic. Some of the mutant strains now in use secured by spore irradiation with ultra-violet light or X-rays give penicillin yields several times exceeding those obtained from the original isolates [*R.A.M.*, xxv, p. 307 *et passim*]. In the fermentation medium commonly employed maize steep liquor and lactose are the chief components [ibid., xxv, p. 407]. The former provides both source of energy and the nitrogenous compounds needed for the building of cellular protoplasm, besides supplying mineral elements, certain growth factors, and possibly a specific precursor of penicillin. The latter furnishes a slowly fermented carbohydrate source which helps to stabilize the pH of the medium throughout the process.

At least five naturally occurring penicillins have been identified, namely, F, G, K, X [ibid., xxv, p. 514], and di-hydro F, and others probably exist.

THAYSEN (A. C.) & MORRIS (MURIEL). **Medium suitable for the cultivation of Meredith's Actinomycete.**—*Nature, Lond.*, clix, 4029, p. 100, 1947.

A cheap medium for the growth of Actinomycetes, containing a minimum of materials likely to interfere with the extraction of the antibiotic [cf. *R.A.M.*, xxv, p. 175], is given by the formula: autolysed yeast extract 0·25 per cent., glucose 0·5 per cent., and distilled water to 100 ml., the pH being adjusted to 6 to 7. This was found very suitable for *Actinomyces* [*Streptomyces*] *griseus* [ibid., xxvi, p. 73], giving growth and antibiotic production equal to that obtained with the usual media [ibid., xxv, p. 572]. The growth-liquor of the authors' antibiotic-producing Actinomycete [loc. cit.] was highly active against a culture of *Cercospora nicotianae* from Baarn claimed to be responsible for a tobacco leaf spot.

MAGROU (J.). **Les facteurs de la tubérisation.** [The factors of tuberization.]—*Bull. Soc. Acclim. Fr.*, xci, pp. 145–167, 2 pls., 4 figs., 1944. [Received January, 1947.]

This is a discussion of the factors governing the process of tuberization in plants, with special reference to the work of N. Bernard and the author on

mycorrhizal symbiosis in orchids and potatoes, respectively [cf. *R.A.M.*, xxv, p. 520 *et passim*].

SNELL (E. E.). **Growth factors for microorganisms.**—*Annu. Rev. Biochem.*, xv, pp. 375–396, 1946.

A bibliography of 153 titles forms the basis of this review of recent advances in the knowledge of the specific nutritional factors required for the growth of fungi and other micro-organisms.

FOLSOM (D.). **Leafroll net necrosis and stem-end browning of Potato tubers in relation to temperature and certain other factors.**—*Phytopathology*, xxxvi, 12, pp. 1016–1034, 1946.

The form of net necrosis occurring as a sequel to leaf roll in potatoes develops in Maine [*R.A.M.*, xix, p. 492; cf. xxvi, p. 25] mostly during the first two or three weeks after lifting. It is favoured by constant temperatures of 45° to 50° F. and is unimportant at 33° and 70°: at these 'threshold' temperatures, in fact, potentially susceptible tubers may be so 'conditioned' as to remain free from the defect even on later transference to the optimum degree of warmth. Relatively large tuber size is sometimes associated with greater frequency of net necrosis and a higher proportion of diseased tubers occurs among those recently invaded by the leaf-roll virus. Varieties such as Bliss Triumph, Katahdin, or Chippewa, that do not develop net necrosis as a concomitant of leaf roll, become relatively more attractive when the spread of the virus increases in a region like Maine, where soil and storage temperatures are conducive to the disorder. Net necrosis may increase considerably in transit and market should the temperature shift towards the optimum.

In Maine stem-end browning of potato tubers, apparently of virus origin [ibid., xxvi, p. 119], responds to temperature and certain other factors in much the same way as net necrosis, but the critical temperatures for the former are somewhat higher, and smaller rather than larger tuber size increases the percentage of incidence.

LE CLERG (E. L.), LOMBARD (P. M.), EDDINS (A. H.), COOK (H. T.), & CAMPBELL (J. C.). **Relation of spindle tuber and leaf roll to percentage reduction in yield of Irish Potatoes as an aid in plant-disease-survey practice.**—*Plant Dis. Reptr*, xxx, 12, pp. 440–445, 1946. [Mimeographed.]

Estimates of crop losses from disease are of fundamental usefulness for plant-disease surveys. The authors, therefore, have presented the data of the results of their study of four potato varieties affected with spindle tuber and two with leaf roll [*R.A.M.*, xxiii, p. 353] as an expression of the percentage yield losses occurring in each variety in each State at seven different levels of disease. They show that as the amount of either disease increased, so there was a progressive percentage decrease in yield. In most States, however, the seasonal effect on yield reduction was very marked. The data for each year are presented, therefore, so that anyone using them for estimation purposes may compare them (and the relevant monthly climatic data) with the corresponding figures for the season for which losses are being estimated.

Since so many factors are, as a rule, involved in the causation of reduced yield, it is impossible to relate yield directly to disease losses. In using the data provided, consideration must also be given to time of planting, rate of application and kind of fertilizer, cultural methods adopted, climatic conditions, and potato variety. Even with these limitations the data presented permit a more accurate estimate of loss than is possible by means of the 'judgements of opinion' commonly practised.

MONTALDO (A.) & AKELEY (R. V.). **Herencia de la reacción a la Phytophthora infestans en la Papa.** [Inheritance of the reaction to *Phytophthora infestans* in the Potato.]—*Agric. tec., Chile*, vi, 1, pp. 12–41, 6 figs., 1946. [English summary.]

Following a survey of the principal contributions to the literature on the inheritance of the reaction to late blight (*Phytophthora infestans*) in the potato [nearly all of which have been noticed from time to time in this *Review*], the authors describe the results of their studies on the response to inoculation with zoospore suspensions of the fungus of the F_1 progeny of crosses between selected clones and of the selfed offspring of the parental clones.

The selfed progenies of two susceptible clones, S4710 2 and 336–18, and one resistant, 95–56, gave means of 3·04±0·07, 2·98±0·06, and 2·46±0·07, in a scale of tuber reactions ranging from 1 (absence of fungal growth) to 4 (rapid development of the pathogen). The means of the hybrids between the two susceptible clones and the resistant were 2·08±0·06 and 1·97±0·06, respectively. Significant positive correlation coefficients were obtained between tuber and foliar reaction in a selfed family of the resistant clone 95–56 and in two crosses in which this clone was one of the parents, the values being 0·54, 0·57, and 0·56, respectively. There was significant correlation between rot reaction and firmness in the tuber for two progenies and non-significant for three others studied. In the former two the variation in the stage of maturity reached at harvest time was much smaller than in the three showing no connexion between tuber decay and firmness.

WILSON (J. D.) & SLEESMAN (J. P.). **Potato-spraying experiments in 1945.**—*Rep. Veg. Gr. Ass. Amer., 1945*, pp. 193–208, 1945. [Abs. in *Chem. Abstr.*, xl, 21, p. 6737, 1946.]

DDT was compared with calcium arsenate in combination with several fungicides in spraying experiments on potatoes in Ohio. Zerlate [*R.A.M.*, xxvi, p. 96] gave a higher yield than Bordeaux, the fixed copper COC–S [copper oxychloride-sulphur], fermate, or dithane when each was used with either insecticide. Zerlate was equal to Bordeaux in early blight [*Alternaria solani*] control, but less effective against late blight [*Phytophthora infestans*].

LE CLERG (E. L.). **Breeding for resistance to early blight in the Irish Potato.**—*Phytopathology*, xxxvi, 12, pp. 1011–1015, 1 fig., 1946.

A large-scale field experiment was carried out in Louisiana in 1945 to test the reactions of 19 named and 445 seedling potato varieties to the early-blight fungus (*Alternaria solani*). Menominee was the only one of the former group to show a marked degree of resistance, and all but about ten of the latter were moderately to severely infected. Menominee is also highly resistant to scab (*Actinomyces scabies*) and moderately so to late blight (*Phytophthora infestans*). Among the early blight-resistant seedlings were four (XL211–1, XL306–2, X528–118, and X627–103) with moderate or high resistance to scab, and two (B273–31 and B273–39) sustaining exceptionally little damage from late blight. The future outlook for breeding for resistance to early blight, combined in some cases with a similar reaction to scab and late blight, appears from these results to be promising.

RIEDL (W. A.), STEVENSON (F. J.), & BONDE (R.). **The Teton Potato, a new variety resistant to ring rot.**—*Amer. Potato J.*, xxiii, 11, pp. 379–389, 1946.

The Teton potato variety, U.S.D.A. Seedling 47102, derived from a cross between Earlaine and an unnamed seedling No. 45146, though not immune from ring rot (*Corynebacterium sepedonicum*), has shown a high degree of resistance to the disease in Wyoming and Maine from 1940 to 1945 under conditions favouring

heavy infection in the susceptible Triumph, Green Mountain, and Katahdin. Teton also produces satisfactory yields and its culinary qualities are reasonably good.

GANGULY (D.). **Helminthosporium disease of Paddy in Bengal.**—*Sci. & Cult.*, xii, 5, pp. 220–223, 1946.

Experimental evidence is briefly adduced in support of the view that seed-borne infection is of little importance in the development of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] in the later stages of growth of the Bengal rice crop [*R.A.M.*, xxv, p. 182]. Overwintered mycelium or conidia in the soil may infect healthy seedlings through the roots or collar, but this does not explain the production of localized leaf spots and sporadic attacks on the ears of adult plants. In tests to determine the extent of wind-borne infection, the deposit of conidia on greased slides inside the plots was found only up to a height of 2 ft. 6 in. and the numbers were insignificant, while none reached the slides placed at a distance of 20 ft. from the plots. Although a large number of grasses were susceptible to *O. miyabeanus* in Nisikado and Miyake's inoculation experiments [ibid., ii, p. 231], no host of the fungus other than rice has been found in nature. For the present, therefore, the source of secondary infection remains obscure.

The computation of the losses due to *O. miyabeanus* was greatly complicated during three seasons of observation by the close similarity of its symptoms on the seed to those of its constant concomitant, *Curvularia lunata* [ibid., xxv, p. 182]. Both these organisms and *Trichoconis caudata* [loc. cit.] indiscriminately induced (*a*) emptiness of the grains, with a purplish-brown discoloration and a fair-sized pale to white area marked off either at the centre or one side; (*b*) brownish tinge, turning dull grey; and (*c*) deep brown spots or discoloration, blackening at maturity.

Seed-borne infection by *O. miyabeanus* [ibid., xxvi, p. 45] is most effectively combated by the hot-water treatment, which is useless, however, as a remedy for the evidently more important secondary phase of the disease. Work is in progress at the Department of Agriculture, Bengal, on the development of resistant varieties. Of 44 tested in 1946, Dahar Nagra 273–32, Patnai 549–33, Patnai 23, Kalma 219, and Nagra 41–14 were the most promising.

ANDERSEN (A. L.) & HENRY (B. W.). **The use of wetting and adhesive agents to increase the effectiveness of conidial suspensions for plant inoculations.**—*Phytopathology*, xxxvi, 12, pp. 1056–1057, 1946.

The use of a spreader-sticker combination consisting of 0·05 per cent. sodium oleate and 0·25 per cent. gelatine facilitated the inoculation of rice leaves with conidial suspensions of *Piricularia oryzae* in experiments at Camp Detrick, Frederick, Maryland, in 1944–5, the average numbers of infections per plant in two tests being 11·1 and 6·5, compared with 0·2 and 0·8, for the water controls. Other moderately effective combinations included 0·1 per cent. soft soap plus 0·1 per cent. gelatine (9·5 and 2·1 infections per plant), and 0·05 per cent. sodium oleate plus 0·1 per cent. gelatine (5·8 and 5·3).

SLEETH (B.). **The effect of fungicidal seed treatments on Guayule seedling emergence.**—*Phytopathology*, xxxvi, 12, pp. 999–1010, 1 graph, 1946.

In 1943 the losses due to pre-emergence damping-off fungi (*Pythium ultimum* and *Rhizoctonia* sp.) in guayule (*Parthenium argentatum*) nurseries and direct field sowings at Salinas, California [see next abstract], were so severe as to necessitate extensive re-sowing. In greenhouse tests to determine the relative efficiency of eight fungicides in the protection of the seedlings against damage from these pathogens, the optimum dosage was about 1 per cent. by weight for arasan, spergon, spergonex (ortho-benzoquinone dionium peroxide), cuprocide, and semesan, 0·5 to 0·75 per cent. for No. 604, and 0·25 per cent. or less for mersolite

19 [ibid., xxiv, p. 287]. The treatment of guayule seed with sodium hypochlorite (two hours' immersion of soaked seed in a solution containing 1 to 1·5 per cent. available chlorine) increased seedling emergence in infested greenhouse and sub-irrigated field plot tests, but significantly superior protection was conferred on readily germinating seed by arasan or No. 604. These two preparations and mersolite 19 produced the maximum increases in seedling emergence from both threshed and unthreshed, non-hypochlorite-treated seed in infested soil. On unthreshed hypochlorite-treated seed, however, mersolite 19 did not give such substantial increases as the other two fungicides. In April and May nursery sowings of dry, threshed, non-hypochlorite-treated seed, arasan, spergon, and semesan raised the emergence level over that of untreated, the first-named being particularly beneficial. The emergence of dry, unthreshed seed pre-treated with sodium hypochlorite and dusted with arasan, spergon, or semesan was superior to the non-dusted in a May sowing, but in April the difference was not significant. Arasan and spergon likewise increased the emergence of similarly treated seed soaked in water for four days before sowing in May, but not in April-sown. In a sub-irrigated field, treatment with arasan or No. 604 resulted in significant increases in emergence, both of threshed and unthreshed seed, over the untreated or that soaked in sodium hypochlorite.

On the basis of greenhouse, nursery, and field trials, arasan and No. 604 are considered to be the most promising of the seed-protectants tested for the control of pre-emergence damping-off of guayule, while mersolite 19, tested only in the greenhouse, gave very encouraging results.

Campbell (W. A.) & Presley (J. T.). **Diseases of cultivated Guayule and their control.**—*Circ. U.S. Dep. Agric.* 749, 42 pp., 7 figs., 1946.

Following some introductory observations on the importance of guayule (*Parthenium argentatum*) diseases in California [*R.A.M.*, xxii, p. 496 and preceding and next abstracts], nursery practices in relation to diseases, and general preventive measures against nursery diseases, accounts are given of the symptoms, economic importance, etiology, predisposing and environmental factors, and control of various troubles affecting the crop in (A) the nursery, (B) storage, and (C) plantations. Included in (A) are: damping-off (*Pythium*, *Phytophthora*, *Rhizoctonia*, and *Fusarium* spp.); seedling root rot and pink rot (*Pythium ultimum*) [ibid., xxv, p. 357]; wilt (*Verticillium albo-atrum*); rots caused by *Sclerotinia sclerotiorum*, *S. minor* [see next abstract], and *Botrytis cinerea*; root rots due to 'drowning' in heavily irrigated, impermeable soils or to pathogenic fungi, occasionally a species of *Phytophthora*; and chlorosis associated with nitrogen deficiency: in (B) *S. sclerotiorum*, *S. minor*, and *B. cinerea*: and in (C), in addition to wilt and *Sclerotinia* rots, root and crown rot (*P. drechsleri*); root rot (*Phymatotrichum omnivorum*) [ibid., xxii, p. 496]; an undetermined bacterial rot; crown rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*: ibid., xxiv, p. 117]; rust (*Puccinia parthenii*); and die-backs due to *Diplodia* [*Botryodiplodia*] *theobromae* [ibid., xxvi, p. 29] and drought, followed by infection with *Alternaria* sp.

S. sclerotiorum and *S. minor* were responsible for the heaviest loss of plantable seedlings in the Salinas nurseries in 1942 and 1943, and were also prevalent and destructive to these seedlings in transit between the nurseries and plantations during the same period. In the latter year *B. cinerea* was almost equally troublesome to young plants in storage. The development of these fungi may be prevented by packing surface-dry seedlings so that they neither lose nor acquire additional moisture and by maintenance at a temperature of 32° to 34° F. Avoidance of excessive moisture is an important means of combating *S.* spp. in the nursery and field; under the latter conditions, however, the losses from this source have so far been inconsiderable.

About one-third of the seedlings grown in the Intercontinental Rubber Company's nursery in 1941 were unfit for transplanting in 1942 owing to the combined 'drowning' and fungal root rot.

Phytophthora drechsleri has caused the most severe damage on the clay soils of the Tracy-Newman district. Braun (abs. in *Phytopathology*, xxxiv, p. 933, 1944) observed the disease in 22 out of 25 fields investigated in September, 1943, and losses of 5 per cent. and upwards were recorded for 625 of the 3,745 acres covered. By the regulation of irrigation practices so as to avoid waterlogging the situation was materially improved in 1944. The root lesions are black, slightly sunken, and firm, while the diseased zone of phloem and cortex is dark brown to greenish-black on freshly dug plants, turning uniformly dull black on drying. The lesions on the tap-roots usually develop 2 to 6 in. below soil-level and may attain a length of 4 in. Infected plants wilt suddenly, the leaves shrivelling, turning grey, and generally remaining firmly attached to the plant. The optimum soil temperature for the growth of the pathogen is about 85°, and the maximum crop reductions occur from June to August; below 60° its development is arrested. On irrigated land it is dependent on soil saturation or near-saturation for upwards of 18 hours. Losses from the disease may be reduced to a minimum by the restriction of the main irrigation of heavy soils to the winter months, when both fungus and host are inactive, and in lighter ones by the avoidance of flooding at the ends of rows or in sunken areas of the fields.

Bacterial rot has caused severe damage in irrigated plantings of the San Joaquin valley and similar symptoms have been observed on indicator plots in Texas. The first external feature of the disease is a wilt of the branches, gradual or sudden according to the degree of succulence of the plants; by the time this becomes noticeable most of the tap-root is badly decayed, its surface being covered with black, resinous masses, to which the soil adheres on pulling from the ground. The affected bark is soft, watery, and somewhat spongy, pale to dark brown, occasionally with a vinaceous tinge. The cortex seems to be the first site of stem invasion and progressive deterioration of the associated tissues is the next step. In some plants the resin exudate spreads over the surface in a brownish film, later turning black.

The losses due to *V. albo-atrum* are difficult to appraise, but limited studies have shown that stunting of the plants, imperceptible to casual observation, caused reductions up to 50 per cent. in dry weight of one-year growth. The most reliable diagnostic criterion of the wilt is a brown discoloration of the walls of the wood elements, while many of the vessels become occluded by a yellowish or brownish wound gum. Schneider has shown (abs. ibid., xxxiv, p. 936, 1944) that different strains of guayule vary considerably in their recuperative capacity in respect of infection by *V. albo-atrum*. For example, plants of strain 109 seldom recover, whereas those of 405, 407, and 416 show a high percentage of partial or total restoration; while the most widely planted 593 is of intermediate susceptibility.

Puccinia parthenii was noted in 1945 on both wild and cultivated guayule in Mexico, whence it had already been reported by Lloyd (*Publ. Carneg. Instn*, 139, 1911), but has not yet been observed on this host in the United States, though it was recorded by Arthur on a closely related *Parthenium* species in Texas (*Bull. Torrey bot. Cl.*, xxxvii, pp. 569–580, 1910). Under normal conditions of cultivation the rust appears to be of little importance.

Campbell (W. A.). **Sclerotinia root rot of Guayule.**—*Plant Dis. Reptr*, xxx, 9, pp. 312–319, 1946. [Mimeographed.]

Root rot due to *Sclerotinia minor* and *S. sclerotiorum* caused considerable losses in a 256-acre guayule [*Parthenium argentatum*] planting near Salinas, California [see preceding abstract]. In 1943 the loss, under moderate irrigation, was less than 1 per cent. In 1944, with no irrigation, very few plants died. In 1945, under heavy

summer irrigation, the average loss was 9 per cent., the range for different areas being 5·3 to 14·4. Isolations from affected plants selected at random indicated that 83 and 17 per cent. of the loss were due, respectively, to *S. minor* and *S. sclerotiorum*. Disease incidence was not related to the sclerotial population in the soil, but was closely related to soil moisture, which was the limiting factor during most of the year. Soil temperatures favoured infection from March to November.

SMART (A. B.). **Soil sterilization on a field-scale.**—*Nature, Lond.*, clix, 4029, p. 102, 1947.

When the insecticide 'gammexane' was mixed with fertilizer and sown with oats through a combine seed drill on old lea, the treated area gave stronger, broader-leaved, deeper green plants than untreated, the difference persisting until the oats were a foot tall. When the same compound was sown broadcast on 'brairded' swedes, a similar effect resulted. It may be assumed from these results that the chlorine liberated from the gammexane effected a partial sterilization of the soil and so increased the available nitrogen.

ROACH (W. A.). **Mineral deficiencies in agricultural and horticultural crops. II.**—*Rep. E. Malling Res. Sta., 1945*, pp. 83–88, 1946.

The author summarizes the main conclusions drawn from four years' work at East Malling on mineral deficiencies in agricultural and horticultural crops [cf. *R.A.M.*, xxv, pp. 98, 120, 362]. Large increases in yield were obtained from curative treatment both when the deficiencies were indicated by symptoms and when no symptoms were apparent. The importance of complete diagnosis was demonstrated by an experiment in which treatment suggested by symptomatical evidence alone was unsuccessful, whereas when the six elements found by plant injection to be lacking were supplied, the crop was doubled. Suggestions are made as to the lines along which future work might proceed.

BEARD (F. H.). **Observations on the incidence of mould (Sphaerotheca humuli) on the new seedling Hops at East Malling in 1945.**—*Rep. E. Malling Res. Sta., 1945*, pp. 107–114, 2 figs., 1946.

During 1945 a serious outbreak of mould [mildew] (*Sphaerotheca humuli*) [*R.A.M.*, xxiii, p. 329; xxv, p. 331] occurred among new seedling hop varieties at East Malling. Of 181 seedlings in short rows of about 15 hills, 13 were attacked in the burr stage and gave no crop, 28 were very severely attacked on the cones, 44 were severely attacked, 30 slightly, 22 showed a trace of infection, and 44 remained unaffected. Incidence was high in certain parentage groups, including the first generations from a wild New Mexican hop [a variety of *Humulus americanus*] and from a wild hop from Manitoba (*H. americanus*). The third generation from the New Mexican hop, the second and third from the Manitoba hop, and the third from a hop of unknown parentage, Oregon Cluster, had a number of unaffected seedlings. Among the larger plantings of named new varieties, none was free from the disease, though Early Promise (X 35) and Malling Midseason (BB 28) showed only a trace, while Brewer's Favourite (OP 21) and Bullion Hop (Q 43) were slightly attacked. Heavy cropping appeared to be associated with high incidence and light cropping with resistance. Notes are given on seven good cropping seedling varieties which remained unaffected.

MARTYN (E. B.). **Sugar cane mosaic in Jamaica.**—*Trop. Agriculture, Trin.*, xxiii, 7, pp. 123–129, 1946.

Having reviewed the history of sugar-cane mosaic in Jamaica [*R.A.M.*, xxiv, p. 34; xxv, p. 279,] the author records that a survey of 22 estates showed that none was free from the disease, though complete commercial control has been

achieved in several, the amount of infection being well under 1 per cent. The higher pathogenicity of the virus on poor soils can be counteracted by planting resistant varieties.

While the transmission of the disease by insect vectors is not considered of major importance, though requiring further entomological study in Jamaica, legislation and the insertion in tenancy agreements of a clause forbidding planting of maize or sorghum, food plants of *Aphis maidis*, generally considered to be the vector, have afforded a certain amount of control. Occasionally serious infection may be correlated with conditions temporarily favouring aphid concentrations, and is more likely to occur in some areas than others.

The damage caused by sugar-cane mosaic is highly debatable. Although high percentages of infection have been present for years on estates planted with BH 10/12, no unusual losses in the ratoon crops have been reported. At the same time, shrinking and splitting of the cane occur which must cause loss of sugar. The canes of the tolerant variety, B 34104, which is highly susceptible in Jamaica, do not appear to suffer from infection; danger arises from the fact that the leaf symptoms may disappear almost entirely with maturity and the use of apparently healthy tops perpetuates the disease; in this way, some estates have become 100 per cent. infected, but commercial control on others has been obtained by taking suitable precautions.

The symptoms of mosaic, which vary in intensity with age, season, and environmental conditions, are described. The green type is found on tolerant varieties, such as B 34104, B 37161, and several recent Barbados seedlings; the yellow-mottled or stippled type on BH 10/12 and on resistant varieties is more variable than the green; and the yellow, blotchy type occurs on the resistant B 3439 and one or two Barbados seedlings. Experiments showed that there is only one strain of mosaic virus occurring generally in Jamaica, causing, however, different symptoms on different varieties.

Some leaves of experimentally inoculated B 3439 plants showed mosaic symptoms, but subsequent leaves were normal; one or two shoots of an inoculated stool showed infection and remained stunted, while the rest developed normally. Tops from seriously infected BH 10/12 on a badly drained clay soil estate grew in the nursery without pronounced symptoms; B 3439, interplanted with 100 per cent. infected BH 10/12, was entirely clean; the mature plants of B 34104 showed some splitting and a greyish discoloration of the lower joints on both healthy and infected stools, but transplanted infected tops showed normal growth. Symptoms on the resistant variety B 37161 were often so slight as to escape detection, but became more prominent, on some shoots more than others, in wet weather, then often disappeared with maturation.

In the autumn of 1944 a single stool of the variety B 34104 with pronounced yellow-mosiac symptoms, stunting, and abnormal tillering was reported. Inoculations from this plant to B 34104, B 3439, BH 10/12, and B 37161, and between these varieties when infected, reproduced invariably the distinctive symptoms, islands of dark green on a paler background. These chlorotic areas become very marked in some seasons and cause conspicuous yellowing. Further inoculations of 12 BH 10/12 and 12 B 34104 plants with both normal B 34104 mosaic and with the strain causing the distinctive symptoms resulted in four plants of B 34104 and one of BH 10/12, out of 21 successful infections, disclosing clearly both types of symptom, sometimes on individual shoots of one stool and sometimes on leaves of the same shoot. It was therefore concluded that the distinctive symptoms were those of a new variety of mosaic, and not merely a different strain.

The author's general conclusion is that, although the complete elimination of sugar-cane mosaic in Jamaica is impracticable, the disease no longer presents a serious threat to the industry.

PADMANABHAN (S. Y.). **Rhizoctonia-leafspot, a new leaf disease of Sugarcane.**—*Curr. Sci.*, xv, 12, p. 353, 1 fig., 1946.

Rhizoctonia [*Corticium*] *solani* was identified as the agent of a hitherto undescribed leaf spot of sugar-cane observed at Gopalpur, Bengal, on Co. 421, at Pusa, Bihar, on Co. 513 and 313, and elsewhere on Co. 513 since 1941. The initial symptom is a small, dull red spot on the lamina, beside the midrib, spreading in concentric zones in which undulating, dull red lines alternate with broader, whitish areas. The lesions extend much more rapidly lengthwise than across the leaf and commonly measure $4\frac{1}{2}$ to 6 by 2 to 3 in. There is a superficial resemblance between these features and those of the 'banded sclerotial disease' [*R.A.M.*, xviii, p. 616], but the dull red coloration and the concentric development of the zones are distinguishing characteristics of the new leaf spot. The symptoms of both diseases appear at the opening of the monsoon season in the early part of July, but while those of the 'banded sclerotial disease' are no longer recognizable in the crop by the end of August or beginning of September, the other leaf spots persist until November or December. Even more important as an aid to diagnosis is the presence on the leaf blades, partially embedded in the tissues, of the dark, irregular sclerotia of the fungus.

DENNIS (R. W. G.) & WAKEFIELD (ELSIE M.). **New or interesting British fungi.**—*Trans. Brit. mycol. Soc.*, xxix, 3, pp. 141–166, 26 figs., 1946.

The following are noted among the new or interesting British fungi collected between 1926 and 1945: *Exobasidium camelliae*, transforming a flower of *Camellia japonica* [*R.A.M.*, xx, p. 470] from Sussex into a thick, white gall; *Herpobasidium filicinum* on *Dryopteris filix-mas* and *Polypodium phegopteris*; *Sphaerulina myrtillina* on living stems of *Vaccinium myrtillus* from Perthshire; *Rhytisma symmetricum* on leaves of *Salix* from Great Yarmouth; *Sclerotinia draytoni*, n.sp., parasitic on gladiolus corms; two fungi provisionally referred to *Phyllosticta mali* [ibid., xviii, p. 464] and *Coniothyrium pirinum* producing apple leaf spots in Ross-shire; *Septocylindrium aspidii* widespread on *Aspidium* fronds in Fife; *Helminthosporium tritici-repentis* [ibid., iii, p. 65] on dead leaves of *Agropyron repens*, *H. dictyoides* [ibid., xiv, 515] on *Lolium*, and (?) *H. stenacrum* on *Agrostis*, all at Kew; *H. dematioideum* on flowers of *Anthoxanthum odoratum*, and *H. triseptatum* [loc. cit.] on withering leaves of *Holcus lanatus* both from Surrey; and *Dactylium dendroides* subsp. *leptosporum* from diseased bracken [*Pteridium aquilinum*] from Yorkshire.

Distinctive conidial and sclerotial characters differentiate *Sclerotinia draytoni* from any species so far recorded on *Gladiolus*. The sclerotia are black, smooth, flat, then convex, 8 to 12 by 3 to 7 mm., in irregular masses up to 2·5 cm. long, agglutinated, white within. The microconidia are globose, 2 to 2·5 μ in diameter. The macroconidiophores arising from the sclerotia, are at first dark, hyaline above, 12 to 15 μ in diameter, twice or thrice branched. The conidia are hyaline or pale fuscus, cylindrical-ellipsoid or narrowly ovate, 8 to 16 by 5 to 7·5 μ. Apothecia are on long stalks, at first infundibuliform, eventually convex. The hymenium is 2·5 to 5 mm. in diameter and the asci cylindrical, 8-spored, 140 to 190 by 7·5 to 9 or 10 μ, and the spore-containing part about 80 μ long. The uniseriate ascospores are narrowly ellipsoid or subfusiform, hyaline, often biguttulate, 12 to 17 by 6 to 8 (average 15 by 6 μ); the paraphyses are filiform with a thick, clavate apex.

The two fungi isolated from three apple leaves caused more or less circular, whitish spots of dead tissue, 2 to 6 mm. in diameter, each sharply defined by a narrow, dark brown line and bearing on the upper surface up to 90 minute black pycnidia. While the pycnidia appeared externally uniform, even from a single spot some yielded hyaline, non-septate, somewhat fusiform, usually biguttulate

spores, 2·5 to 6 by 2 to 4 (mostly about 5 by 3) μ, and others very pale brown, elliptical, non-guttulate spores measuring 4 to 5 by 2 to 3 μ. The former were tentatively referred to *Phyllosticta mali* and the latter, at first, to *C. tirolense*, not hitherto reported in Britain. Cultures from spores of the *Coniothyrium* consisted of a thin, brown mycelial mat with dispersed clusters of black pycnidia containing characteristic *Coniothyrium* spores, 3 to 5 by 2 to 2·5 average 4·3 by 2·8 μ. This fungus was non-pathogenic to Doon Star potato tubers, but produced small, circular, superficial, blackish lesions on apples, and caused a rather slow rot of tomatoes. Reference to the literature showed that this pathogen would be more correctly designated *C. pirinum*. When the host ranges of both fungi become known, a revision of the nomenclature may be necessary.

VIENNOT-BOURGIN (G.). **Nouvelle contribution à l'étude de la flore cryptogamique du Valais (Suisse).** [A new contribution to the study of the cryptogamic flora of Valais (Switzerland).]—*Rev. Mycologie*, N.S., ix, 4–6, pp. 37–74, 7 figs., 1944. [Received October, 1946.]

In this further annotated list of fungi collected in Valais, Switzerland [*R.A.M.*, xv, p. 530], the author records *Tilletia controversa* [ibid., xx, p. 495] in the caryopses of *Agropyron glaucum*. The chlamydospores, which measured 15 to 19 by 14·5 to 19 (average, 17·9 by 16·9) μ, resembled those of *T. caries*, being globular to slightly ovoid. The dark brown wall, about 2 μ thick, was covered with wide, polyhedric alveoli.

PETRAK (F.). **Beiträge zur Kenntnis der orientalischen Pilzflora.** [Contributions to the knowledge of the oriental mycoflora.]—*Ann. naturh. Mus. (Hofmus.) Wien* lii, pp. 301–396, 1941 (issued 1942). [Received December, 1946.]

This copiously annotated critical study of several collections of mycological specimens comprises one new subgenus, 31 new species, and one new variety. Among the records may be mentioned *Puccinia allii* on *Allium ampeloprasum* [*R.A.M.*, xix, p. 365] in Chalcidice, Greece; *P. glumarum* on *Aegilops triuncialis*, *P. graminis* on *Berberis densiflora*, *Pseudopeziza trifolii* [ibid., xxv, p. 455] on *Trifolium incanum*, *Polythrincium* [*Cymadothea*] *trifolii* [ibid., xxiv, p. 388; xxv, p. 454] on *T. tomentosum*, *Septoria cynodontis* on *Cynodon dactylon*, *S. graminum* on wheat, and *S. quercicola* on *Quercus longipes*, all in Persia; and *Rhabdospora* (S.) *viciae* [ibid., xix, p. 601] on *Vicia stricta* in eastern Macedonia, Turkey.

RAYSS (T.) & ZWIRN (E.). **Some interesting Ustilaginales new to Palestine.**—*Palest. J. Bot.*, J. Ser., iii, 2, pp. 114–116, 1944. [Received December, 1946.]

Entyloma dahliae is reported on *Dahlia variabilis* leaves for the first time from Palestine, and to the best of the authors' belief it has not been previously recorded in the Mediterranean region [cf. I.M.I. map No. 114] or the Near East.

Since 1938 *Urocystis tritici* has been found year after year on wheat (*Triticum durum*) in a field at Kiryat-Anavim, and in 1941 it was detected in another locality in the Judean mountains. This is believed to be the first indication of the smut on field plants in Palestine, though it was found by Minz on wheat straw imported as packing from the United States [*R.A.M.*, xxiii, p. 336]. The presence of flag smut has been established in Japan, China, India, Australia, the United States, South Africa, Germany, Holland, South Russia, Bulgaria, Italy, Spain, the Caucasus, Turkestan, Cyprus, and Egypt, while information has been received from Dr. Bremer (*in litt.*) of its occurrence in Turkey. The appearance of this very destructive disease in Palestine gives reason for grave apprehension.

Ustilago scorzonerae [ibid., xiii, p.749] was found in the inflorescences of *Scorzonera papposa*, a new host for the smut.

Hirschhorn (Elisa). **Refundición del género 'Sphacelotheca' en 'Ustilago'.** [Reclassification of the genus *Sphacelotheca* as *Ustilago*.]—*Physis, B. Aires*, xv, 47, pp. 103–111, 1939. [Received September, 1946.]

From a re-examination of over 40 Argentinian Ustilagineae the author makes the following taxonomic changes based on the morphology of the chlamydospores (the main distinguishing feature of the genera under observation); *Ustilago hydropiperis* (Schum.) syn. *Sphacelotheca hydropiperis* (Schum.) de Bary on *Polygonum acre*; *U. cordobensis* syn. *S. cordobensis* (Speg.) Jack. on *Panicum insularis*; and *Cintractia sorghi* (Link) syn. *S. sorghi* (Link) Clint. [*R.A.M.*, xix, p. 240] on sorghum.

Crook (E. M.) & Sheffield (F[rances] M. L.). **Electron-microscopy of viruses: I. State of aggregation of Tobacco mosaic virus.**—*Brit. J. exp. Path.*, xxvii, 5, pp. 328–338, 2 pl., 1946.

Preparations of purified tobacco mosaic virus, separated by Bawden and Pirie's method of differential ultra-centrifugation [*R.A.M.*, xxiv, p. 292], were examined in the electron microscope. Micrograms of the most slowly sedimenting fraction (A) contain particles mostly no longer than their diameter (15 mμ), and indistinguishable on cursory inspection from the spherical tomato bushy stunt and tobacco necrosis viruses. Critical examination showed the sizes in descending order to be tomato bushy stunt, tobacco necrosis, and tobacco mosaic A-type, corresponding to their sedimentation constants of 132, 112, and 30×10^{-13} respectively. With a rising sedimentation rate (fractions B to D) the specimens contain rods of increasing length. Micrograms of crude sap show rods mixed with other plant constituents. Maintenance of the virus for three weeks at 4° C. causes the aggregation of some particles, and this process may be carried further by incubation with phosphate (2 gm. per l.). Heating under certain conditions to 60° or incubation with trypsin at 37° produces many rods exceeding 5 μ in length. No appreciable disaggregation resulted from drying.

Particle length varies also in potato virus X. In no preparation of a rod-shaped virus were all the particles of uniform length, and in the tobacco mosaic virus some of type A were always present. All the evidence points to the dependence of the average rod length on preparative treatment.

Delle Coste (A. C.) & Zabala (S.). **La peste negra del Tomate o 'corcovo' del Tabaco.** [The black pest of Tomato or 'corcovo' of Tobacco.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, ii, 17, 23 pp., 4 figs., 1946.

Important contributions to the literature on tomato 'black pest' and tobacco 'corcovo', two distinct manifestations of the same virus [tomato spotted wilt virus: *R.A.M.*, xxv, p. 28], are summarized and discussed in the light of the authors' comparative studies on the disease in Argentina. The following plants proved more or less susceptible in inoculation experiments with the juice of infected plants: *Antirrhinum majus*, groundnut, *Atropa belladonna*, *Callistephus chinensis*, chilli, *Cestrum parqui*, cineraria, *Cyphomandra betacea*, *Datura ferox*, *D. stramonium*, *D. meteloides*, the Jane Cowl dahlia variety, *Hyoscyamus niger*, *Nicotiana glauca*, *N. glutinosa*, *N. longiflora*, *N. rustica*, *N. sylvestris*, *Ocimum basilicum*, *Petunia hybrida*, *Physalis* sp., *Primula* sp., *Salpichroa origanifolia*, gloxinia (*Sinningia* [*speciosa*]), *Solanum capsicastrum*, eggplant, *S. pocote*, potato, *Tropaeolum majus*, vetch, and *Zinnia elegans*. In every case the juice from the artificially infected plants was reinoculated into tomato and *N. glutinosa* with positive results.

Reichert (I.) & Palti (J.). **Powdery mildew of Tomatoes.**—*Hassadeh*, xxvi, p. 547, 1946. [Hebrew.]

The causal organism of tomato powdery mildew (*Oidiopsis taurica*) is a pronounced xerophyte, and its occurrence in Palestine [*R.A.M.*, xxiv, p. 476] in a

severe form on plots planted from May to July is largely restricted to Upper Galilee and the vicinity of Haifa, though outbreaks may also develop in the western Valley of Esdraelon and near Jerusalem. On plots planted from August to October the disease may be destructive in the Jordan Valley and the eastern Valley of Esdraelon. Under favourable conditions of atmospheric humidity (52 to 75 per cent.) and temperature (a daily mean approximating to 25° C.), the first symptoms of infection generally appear five to seven weeks after transplanting to the field. Effective control may be obtained by dusting with sulphur or spraying with sulfinette, cita Californian spray (both at a strength of 1·5 per cent.) or the dispersible sulphur spray spersul (1 per cent.), the first application to be made six weeks after planting and further treatments given weekly during the period of active growth, after which the intervals may be extended to 10 to 12 days; the operations should be discontinued three to four weeks before the picking of the last fruits is due. On furrow-irrigated plots the action of all the above-mentioned preparations is about equal, but where overhead irrigation is practised spraying appears to be preferable to dusting. For the joint control of powdery mildew and diseases requiring copper-containing fungicides, these should be combined with 1 per cent. spersul.

McCOLLOCH (L.) & POLLACK (FLORA G.). **Helminthosporium rot of Tomato fruits.**—*Phytopathology*, xxxvi, 12, pp. 988–998, 3 figs., 2 graphs, 1946.

Since 1934 United States plant quarantine inspectors have intercepted 17 lots of tomato fruits from Mexico, two from Haiti, and one from British Guiana bearing circular to irregular areas, 10 to 30 mm. in diameter, flattened to slightly sunken, with dark to black centres, surrounded at a temperature of 60° to 80° F. by a cream-coloured zone, serving as an important diagnostic character, with an outer ring of bay to burnt sienna to mahogany-red. Occasional lesions advanced slowly at 70° and the cream-coloured zone was absent, the fruits in such cases resembling those attacked by *Alternaria*. At lower temperatures, especially at 50°, the spots were poorly defined and penetration was so slow that by the end of a week the tissue was not completely killed but presented a bronzed appearance. The firm, spongy rot extended deeply into the fruit, and the necrotic tissue was intersected by the dark grey mycelium of the fungus, which also covered the exterior of the lesions and quite obscured their characteristic aspect.

The conidiophores of the causal organism, which is named *Helminthosporium carposaprum* Pollack n.sp., are erect, multiseptate, dark-coloured, 140 to 150 by 6 to 10 μ, sometimes tapering to a width of 4 to 6 μ at the frequently paler apex, while the base is formed by a thick-walled, dark brown, bulbous cell, 12 to 16 by 10 to 12 μ. Under very humid conditions conidiophores are produced as lateral or terminal branches of the hyphae, usually narrower (4 to 6 μ) than those arising from the fruits, and of variable length. Geniculations were not observed. The subhyaline to pale olivaceous, straight or curved, mostly cylindrical, 1- to 5-septate conidia measure 28 to 220 by 6 to 12, usually 120 to 160 by 8 to 10 μ, and are frequently produced acropetally in long chains. When budded they are commonly smaller, paler, and often continuous. Germination is effected by means of one or two polar germ-tubes.

H. carposaprum grew freely on various nutrient agars, as well as on autoclaved green stems of tomato and of a coarse wild grass, sporulation occurring within a week at 70° to 80°. The fungus was shown to tolerate a wide range of temperature, making slight growth at 40° and remaining viable after 51 days at 16°.

Inoculations on tomato stems, foliage, and fully grown green fruits indicated that *H. carposaprum* is a weak parasite. It caused slow to moderate decay on inoculation into harvested eggplant, bell pepper [chilli] (*Capsicum frutescens* var. *grossum*), scallop squash, and York Imperial apple fruits.

The rot does not appear to have increased significantly during the past 11 years, nor have any records been received of its occurrence in the United States.

The 1946 epiphytotic of late blight on Tomato.—*Plant Dis. Reptr, Suppl.* 165, pp. 298–345, 1 fig., 1 map, 1946. [Mimeographed.]

Reports [the results of which are summarized in tabular form] received from different parts of the United States on the epidemic outbreak of tomato late blight [*Phytophthora infestans*] in 1946 showed that it was more or less confined to the east coast States and that the losses sustained ranged from under 1 per cent. in Illinois to 75 per cent. for the early commercial crop in Alabama, for 'green wraps' in Virginia, and the home-garden crop in Massachusetts; in Rhode Island the losses ranged from 70 to 90 per cent. In general, the major damage was done to maturing plants. In many States, however, there was severe infection of young plants, both imported and home-grown. Most growers who attempted control reported spraying to be more effective than dusting, but poor control was due more to lack of equipment and late starting than to the type of application. Figures indicate that in many States few growers, if any, used control measures at all. During 1947 growers are to be warned when infection threatens.

FOSTER (H. H.). **A report on certain Tomato lines, selections and varieties under observation at the Mississippi Truck Crops Branch Station during 1945 and 1946.**—*Plant Dis. Reptr*, xxx, 11, pp. 410–416, 1946. [Mimeographed.]

Observations in 1945 and 1946 at the Mississippi Truck Crops Branch Station on the reaction to disease of certain tomato lines in greenhouse and field plot experiments showed that certain selections from lines 5 and 8 (seed source: U.S. Vegetable Breeding Laboratory, Charleston, South Carolina), showed marked tolerance of or resistance to early blight (*Alternaria solani*) [*R.A.M.*, xxv, p. 191] and resistance to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*]. Some F_2 plants from lines 44B284, 44B278, 44B285, 44B277, and 44B389 (seed source: U.S. Beltsville Station, Maryland) were markedly tolerant of or resistant to early and late blight (*Phytophthora infestans*) [ibid., xxv, p. 584]. Certain selections from line 14 (Indiana Station seed) were highly resistant to *F. bulbigenum* var. *lycopersici*, while other lines highly resistant or resistant to this fungus were selections from line 76 (Ohio seed), from lines 45, 46, 47-B, and 61 (Missouri), and from line 29 (Mississippi). Of 14 named varieties tested only Pan America was highly resistant to *Fusarium* wilt but it did not show marked resistance to the foliage blights. Sioux is recommended for districts where wilt is not prevalent.

JONES (MILDRED M.). **Blight-resistant Chestnuts.**—*Amer. Fruit Gr.*, lxvi, 41 p. 35, 1946.

Since 1937 a Maryland grower has kept records of the yields from his 19 blight [*Endothia parasitica*]-resistant Chinese chestnut (*Castanea mollissima*) trees [*R.A.M.*, xxiii, p. 320]. There was an increase over the initial yield of 118·75 lb. in every year except two up to 1943, when the harvest amounted to 749·5 lb. A hurricane reduced the output in 1944 to 678 lb. Plantings should be made where strict sanitation can be practised to free the nuts from weevils.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xx, 9–10, p. 85 M, 1946.

INDIA. A Bureau of Plant Protection and Quarantine modelled on that of the United States is to be established in India, with headquarters at New Delhi. Its main purposes will be to prevent the entry of foreign pests and diseases, regulate inter-provincial movements of plant materials, and eradicate pests and diseases already present.

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WENT (JOHANNA C.). **Verslag van de onderzoekingen over Iepenziekten, verricht op het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn, gedurende 1944. Verslag van de onderzoekingen over de Iepenziekte, verricht op het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn, gedurende 1945.** [Report on the investigations on Elm diseases conducted at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1944. Report on the Elm disease investigations conducted at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1945.]—*Meded. Inst. toegep. biol. Onderz. Natuur* 41, pp. 5–24, 1946.

The inoculations performed in connexion with the project of testing elm seedlings for their reaction to the agent of the Dutch elm disease [*Ceratostomella ulmi*: cf. *R.A.M.*, xviii, p. 557] numbered 6,000 in 1944 compared with 4,440 in 1943. The decision was again reached to continue the work of hybridization with *Ulmus hollandica vegeta*, *U. foliacea* Nos. 1 and 28, *U. glabra* No. 49, *U. wallichiana*, and *U. pumila pinnato-ramosa*. Specially promising results were given by the cross between *U. h. vegeta* and *U. foliacea* No. 1. The incidence of infection (60 per cent.) among the progeny of open-pollinated *U. foliacea* Christine Buisman was no lower than the average for other varieties. Inoculated scions of six selected lines appeared to remain completely healthy, viz., two of the cross between *U. h. vegeta* and *U. foliacea* No. 1, one each of *U. h. pitteursi* × *U. h. vegeta* and *U. h. vegeta* × *U. foliacea* No. 28, and the open-pollinated Nos. 5 and 25. Ten of the 48 inoculated specimens of *U. foliacea* No. 62 contracted infection by *C. ulmi*.

The study on the period of maximum susceptibility in elms to infection by *Nectria cinnabarina* [cf. ibid., xvii, p. 142] had to be suspended owing to the loss of virulence by the strains used as inoculum: a series of fresh isolations was made to replace them. The results of fertilizer experiments clearly showed that heavy applications of potash enhance the disease.

In 1945 the scope of the Dutch elm disease trials was limited. For six consecutive years the French seedling *U. foliacea* No. 62 and its scions have shown a reasonably high degree of resistance, with 12·8 per cent. infection (as against 7·4) for Christine Buisman; the somewhat greater susceptibility of the former line is outweighed by the generally mild nature of the symptoms, which had, as a rule, disappeared by the end of the summer. It was proposed to distribute material of *U. foliacea* No. 62 to nurserymen in 1946. The outcome of trials with the lines No. 132 of *U. hollandica* No. 5 and Nos. 139 and 147 of *U. h. vegeta* × *U. foliacea* No. 1 was also very encouraging. *U. hollandica*, *U. wallichiana*, and *U. laciniata nikkoensis* appear to provide the best material for female parents.

In an experiment involving the inoculation of 450 seedlings with three strains of *C. ulmi*, E6a, E3b, and 3_2, the last-named, isolated in 1936, caused a lower percentage of infection (30·2), with a higher proportion of mild cases, than the first two, dating from 1943 (44·8 and 39·6, respectively). These disparities seem to reflect a gradual loss of virulence in the case of 3_2 [cf. ibid., xxiv, p. 344].

When the inoculation tests with *N. cinnabarina* were resumed at the beginning of April, 1945, *U. foliacea* Christine Buisman developed much more extensive cortical necroses than *U. hollandica belgica*.

Gilbert (S. G.), Sell (H. M.), & Drosdoff (M.). **The effect of copper deficiency on the nitrogen metabolism and oil synthesis of the Tung tree.**—*Plant Physiol.*, xxi, 3, pp. 290–303, 1946.

At the Field Laboratory for Tung Investigations, Gainesville, Florida, the leaves and fruit of copper-deficient *Aleurites fordii* [*R.A.M.*, xxiii, p. 463] were compared with those of normal trees in the same orchard at different times during the growing season to determine the effect of the shortage on the metabolic processes. The percentage of reducing sugar in the copper-deficient foliage was found to be low and that of starch outstandingly so, while the total nitrogen of the affected leaves always exceeded that of normal ones tested at the same time. Accumulation of the water-insoluble fraction, which largely accounted for the high nitrogen content, was a characteristic symptom of the deficiency, and it seems probable that in the absence of sufficient copper the plant forms abnormal quantities of complex nitrogen compounds at the expense of the carbohydrate reserves. The most important effect of the copper shortage on the fruit was the failure of the kernel to reach a normal size and synthesize a proper amount of oil.

Mielke (J. L.). **Observations on Coleosporium crowellii.**—*Plant Dis. Reptr*, xxx, 11, pp. 422–423, 1946. [Mimeographed.]

In 1940, *Coleosporium crowellii* [*R.A.M.*, xix, p. 7] was fairly common on *Pinus edulis* in one part of the Black Range in the Gila National Forest, New Mexico, and on the same host in the Mesa Verde National Park, Colorado, in 1942. In September, 1945, this host was extensively infected in Grand Canyon National Park, Arizona, on the south side of the canyon, affected trees being found over several square miles. There was some evidence of differences in individual susceptibility. All but the current season's needles were infected, and the diseased needles were still green. In June, 1946, the infected needles were dead and were being cast. The trees most severely attacked had a very ragged appearance, but did not seem likely to die.

Scheffer (T. C.). **The decay resistance of Oak wood.**—*Spec. Release Div. For. Path., U.S. Dep. Agric.*, 13, 6 pp., 1 graph, 1943. [Mimeographed. Received January, 1947.]

The common belief that heartwood of the species comprised for commercial purposes within the red oak group, viz., northern red (*Quercus borealis*), scarlet (*Q. coccinea*), and black (*Q. velutina*), is uniformly low in resistance to decay was confirmed by inoculation tests with three wood-destroying fungi (*Poria*, *Lenzites*, and *Stereum* spp.) [cf. *R.A.M.*, xxii, p. 333] on the increment cores from trees with a diameter of 15 to 18 in. at breast height in the major oak-producing regions near or east of the Mississippi and in one locality in Oregon. Heartwood of the white oak group, consisting of chestnut oak (*Q. montana*), Oregon white (*Q. garryana*), white (*Q. alba*), and swamp chestnut (*Q. pinus*), proved to be generally more resistant than the red, the chestnut and white in particular giving promise of suitability for service conditions involving high risks of deterioration [cf. ibid., xxii, p. 460]. The upper logs provided rather more resistant heartwood than the lower, and the outer heartwood is markedly superior in this respect to the inner. Oak sapwood should not be used under conditions likely to promote decay.

CHRISTENSEN (C. M.) & MOSES (C. S.). **Molds and bacteria that delaminate plywood bonded with casein and soybean glues.**—*Spec. Release Div. For. Path. U.S. Dep. Agric.* 25, 23 pp., 2 figs., 3 graphs, 1945. [Mimeographed.]

Scopulariopsis brevicaulis and *Penicillium glaucum* were the predominant moulds growing in casein-glued yellow birch plywood. Either of them, in conjunction with the bacteria normally present in the glue and surviving the gluing process, was capable of the rapid delamination of plywood shear specimens (3 by 1 in.) bonded with any of the five casein glues and one soy-bean brand tested. The bacteria alone were also capable of causing complete delamination. Other species exerting a similar effect were *Cladosporium* sp., *Torula* sp., and *Trichoderma lignorum* [*T. viride*], the first-named acting more rapidly than the other two. Exposure to the normal microflora of the air was followed by faster delamination than was induced by inoculation of the specimens with cultures of any of the fungi used. Sodium trichlorophenate (5 per cent.) prevented any weakening of the glued joints either by *S. brevicaulis* or bacteria over a period of 26 days; sodium ortho-phenylphenate (5 per cent.) controlled the latter better than the former. Sodium pentachlorophenate (2 per cent.) also effectively protected two of the casein glues from bacterial action.

KLINKENBERG (CAROLINE H.). **Anatomisch onderzoek van de vergelingsziekte van Bieten, vergeleken met enkele andere Bietenziekten.** [Anatomical study of Beet yellows disease compared with certain other Beet diseases.]—*Meded. Inst. Suikerprod., Bergen-o-Z.*, 2, pp. 33–65, 26 figs., 1946. [English summary.]

An anatomical study at the Institute for Rational Sugar Production, Bergen-op-Zoom, Holland, of sugar beets and some fodder and garden varieties affected by the beet yellows virus [cf. *R.A.M.*, xix, p. 385] showed that the sieve-tube gummosis constantly associated with the disease develops only after the flow of carbohydrates has been arrested, and should therefore be regarded as a secondary effect of the pathological condition of the phloem. Excess of carbohydrates in the leaves is responsible for the chlorosis as well as for a thickening of the texture often developing at the same time.

A second type of necrosis, of obscure origin, is difficult to distinguish macroscopically from that of beet yellows virus, but there are anatomical differences between the two, a conspicuous feature of the former being the very darkly stained necrotic substances in the wood vessels.

Necrotic changes are also characteristic of beets infected by *Verticillium dahliae* [ibid., iv, p. 495], in which dark substances are produced first in the xylem and later also in the surrounding tissues. This form of necrosis is liable to spread to the surface of the petioles and induces the familiar discoloration of the stem base.

The internal modifications herein described afford reliable diagnostic criteria of the three diseases under discussion.

STEVENSON (J. A.). **A leaf-blight of Jack-Bean in Cuba.**—*Plant Dis. Reptr*, xxx, 4, p. 125, 1946. [Mimeographed.]

Examination of jack bean (*Canavalia ensiformis*) leaves collected some years ago in Cuba by the late Dr. J. A. Faris showed the presence of a spotting and blighting of the leaflets sufficient to cause considerable loss of leaf area and even partial defoliation. The spots were at first roughly circular, up to 1 cm. in diameter, and dull brown, with a definite dark border; they soon became irregular and merged together, involving large portions of the leaflets. Finally, they became ashen on both surfaces. The causal organism appeared to be identical morphologically with *Pellicularia filamentosa* [*Corticium solani*].

Arango y Mestre (O.). **Manera de combatir los principales insectos y enfermedades que afectan al cultivo de los Frijoles.** [Mode of combating the principal pests and diseases affecting Bean cultivation.]—*Rev. Agric., Habana*, xxviii, 4, pp. 52–53, 1 fig., 1945.

Directions are given for the control of various bean [*Phaseolus vulgaris*] diseases, including the mosaic virus, mildew [*Erysiphe polygoni*], and rust [*Uromyces appendiculatus*], by means of cultural practices appropriate to Cuban conditions and spraying with Bordeaux mixture, accompanied in the case of the virus by the periodical roguing of infected plants.

Burkholder (W. H.) & Bullard (E. T.). **Varietal susceptibility of Beans to Xanthomonas phaseoli var. fuscans.**—*Plant Dis. Reptr*, xxx, 12, pp. 446–448, 1946. [Mimeographed.]

The bacterial blight of beans, 'fuscous blight' caused by *Xanthomonas phaseoli* var. *fuscans* [*R.A.M.*, xxiii, p. 512], is now common on Michelite pea beans [*Phaseolus vulgaris*] in New York State and is expected to spread to other varieties. It was found once on Marrow beans, and the junior author ascertained that Hidatsa Red, highly resistant to *Pseudomonas* [*medicaginis* var.] *phaseolicola*, is susceptible.

Inoculation experiments under greenhouse conditions on 40 varieties and strains of field and garden beans showed that Great Northern No. 1, which is resistant to *P. medicaginis* var. *phaseolicola* and to the two viruses causing bean mosaic [bean mosaic virus and Southern bean mosaic virus], is also resistant to fuscous blight. This bean is not grown commercially in the eastern areas of the United States, but is valuable for breeding purposes.

Palti (J.). **Downy mildew of Cucumbers and Melons.**—*Hassadeh*, xxvi, pp. 403–404, 1 fig., 1946. [Hebrew.]

Cucumber and melon are the only hosts of downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) so far observed in Palestine, where the disease does not ordinarily appear until mid-June or early July, 25th May being the earliest date on record. The pathogen is most destructive under the conditions of abundant humidity and moderately high temperature prevailing in the coastal plain, in the western part of the Valley of Esdraelon, in the mountains of Samaria, and in parts of Galilee. Overhead irrigation provides an atmosphere conducive to the development of *P. cubensis* and should not be practised where the fungus is rife. On furrow-irrigated plots the disease is most effectively combated by dusting with sulphur [cf. *R.A.M.*, xxiv, pp. 199, 263], the initial application being made a few days after the formation of the first true leaves and the treatments continued weekly until about a fortnight before the end of harvesting. Cucumber and melon powdery mildew [*Erysiphe cichoracearum*] may be simultaneously combated by this programme.

Morwood (R. B.). **Peanut crown rot.**—*Qd agric. J.*, lxiii, 1, pp. 18–19, 1946.

In this account of crown rot disease of groundnuts [*Aspergillus* sp.: *R.A.M.*, xxv, p. 248] it is stated that the fungus enters through lesions in the testa. The disease although causing wilting differs from true wilt [*Fusarium* or *Verticillium* sp.: loc. cit.] in that the root tissues shrink, darken, and become shredded. The depletion of seedling stands is most serious and any check to germination such as adverse moisture conditions, a poor seed-bed, soil deterioration, and particularly successive plantings of groundnuts will promote the development of the seedling blight. Besides the use of treated seed (supplied by the Queensland Peanut Board) suitable rotations with maize, grain sorghums, Sudan grass, or cowpeas are essential, and the inclusion of a three-year Rhodes grass [*Chloris gayana*] sward in each decennial period is desirable.

REICHERT (I.) & CHORIN (M.). **The high mortality of Groundnuts in 1941.**—*Hassadeh*, xxii, 7, pp. 197–199, 1942. [Hebrew. Received December, 1946.]

Groundnuts in the central coastal plain of Palestine were affected in 1941 by leaf spot (*Cercospora personata*), causing necrosis, desiccation, and defoliation, and two types of root rot, one due to *Sclerotium bataticola* [*Macrophomina phaseoli*: *R.A.M.*, xxiii, p. 187 *et passim*] and the other to a *Fusarium*. The former root-rot pathogen also attacks the stem, while the latter is confined to the underground portions of the roots, whence it spreads to the nuts, penetrating the shell and enveloping the seed in its whitish-violet mycelium. The violet discoloration of the diseased organs is a diagnostic feature of the rot, serving to differentiate it from the blackening caused by *M. phaseoli*. The loss from root rots as a whole is computed at 10 per cent. of the crop.

BLEDSOE (R. W.), HARRIS (H. C.), & TISDALE (W. B.). **Leafspot of Peanut associated with magnesium deficiency.**—*Plant Physiol.*, xxi, 2, pp. 237–240, 1 fig., 1 diag., 1946.

At the Florida Agricultural Experiment Station Dixie Runner groundnut plants in sand cultures developed foliar chlorosis, beginning 24 days after withdrawal of magnesium on the first leaf below the growing tip of the oldest branches; ten days later the condition had spread downwards to the fourth or fifth leaf, while the youngest leaves of all the branches, including the main shoot, were also affected. On the 28th day after the withdrawal of the magnesium, when the plants were 103 days old, a leaf-spotting started on the chlorotic foliage and progressed in the same order as the deficiency symptom; *Mycosphaerella* [*Cercospora*] *arachidicola* [*R.A.M.*, xxv, p. 58] was isolated from the lesions. On the 41st day 3,502 spots were counted on the terminal and 30 on the basal leaflets of the minus-magnesium plants compared with 6 and 15, respectively, on those supplied with a modified form of Hoagland complete nutrient solution (*Circ. Calif. agric. Exp. Sta.* 347, 1938). The magnesium contents of the terminal, central, and basal leaflets of the minus-magnesium plants were 0·012, 0·022, and 0·082 per cent., respectively, of the dry weight, the corresponding figures for those in the complete-nutrient series being 0·307, 0·317, and 0·401 per cent., respectively.

It would appear from these data that magnesium deficiency is either directly or indirectly responsible for the susceptibility of the plants to *C. arachidicola*.

BARSS (H. P.). **Conference on Sweetpotato internal cork; a probable virus disease.**—*Plant Dis. Reptr*, xxx, 11, pp. 418–420, 1946. [Mimeographed.]

In a discussion held at the Edisto Experiment Station, Blackville, South Carolina, on 12th September, 1946, in which all the available information on sweet potato internal cork [*R.A.M.*, xxv, pp. 97, 289; xxvi, p. 145] was reviewed, it transpired that extensive surveys in South Carolina had disclosed no section free from foliage symptoms and no seed stocks that were unaffected. The disease is known to be present throughout North Carolina, is widespread in Georgia, but confined to limited areas, and in Tennessee was found only in one small area, where all the affected stocks have been destroyed.

As a rule, there is no foliage necrosis and no evident reduction in yield, but the corky areas in the flesh, though not affecting the flavour or consistency of the surrounding tissue, are in themselves objectionable. No high percentage of affected plants has so far been found in the general run of commercial crops.

The amount of internal corking present differs greatly with the variety, Porto Rico showing much and Nancy Hall a great deal less. Some varieties show few or no root symptoms, but pronounced foliage symptoms. The cork spots of the roots are permanent and increase in number and area during the growing season and even more during storage.

Transmission by core grafts [cf. ibid., xxv, p. 93] was invariably successful, so that little doubt remains of the virus nature of the condition.

Bosc (M.) & Benezech (C.). **Sur le métabolisme glucidique des ceps de Vigne sains et court-noués.** [On the glucose metabolism of healthy and court-noué Vine stocks.]—*C.R. Acad. Sci., Paris,* ccxii, 26, pp. 1168–1169, 1941. [Received, 1946.]

In June, 1939, analyses of the glucose contents of extracts of healthy and court-noué Aramon and Carignan vine stocks yielded the following values (in gm. per l.): healthy and diseased leaves, 9·5 and 15·1, respectively; healthy and diseased flowers, 6·7 and 4·3, respectively. In a further test in September, 1940, the glucose contents (in gm. per kg.) of healthy foliage, tendrils, and roots before and after protracted hydrolysis at 80° C. were 19·7 and 19·7, 6·8 and 7·4, and 13·63 and 13·70, respectively, the corresponding figures for court-noué material being 29·15 and 30·53, 11 and 11·88, and 7·95 and 7·82, respectively. Thus, the reducing sugar content of the leaves and tendrils is higher, and that of the flowers and roots lower, in court-noué than in healthy vines. The abnormal glucogenesis of the foliar tissues accounts for the attenuation of the symptoms in darkness and their intensification under exposure to the sun's rays, as well as for the heavy fruit yields of diseased stocks, with their large glucose reserves in the tendrils. The 'coulure' [shedding: *R.A.M.*, iii, p. 700] observed at flowering time is also explained by the low reducing sugar content of the floral organs.

Gallay (R.) & Staehelin (M.). **Bouillie bordelaise, oxydules de cuivre et oxychlorures de cuivre dans la lutte contre le mildiou de la Vigne.** [Bordeaux mixture, copper oxides, and copper oxychlorides in the control of Vine mildew.]—*Rev. romande Agric., Vitic., Arboric., 1947*, 1, pp. 3–5, 1947.

Parallel experiments were carried out in three localities, one in each of the cantons of Vaud, Neuchâtel, and Ticino, Switzerland, in 1946 to determine the relative efficiency for vine downy mildew (*Plasmopara viticola*) control of 2 per cent. Bordeaux mixture, 1·5 per cent. copper oxychloride, and 0·5 per cent. copper oxide [cf. *R.A.M.*, xxv, p. 153]. The average efficiency indices (where 100 represents absolute freedom from infection) for the three preparations were 99·4, 97·3, and 96·9, respectively, compared with 0 for the controls. On the basis of these results any of the three fungicides may be recommended for pre-blossom treatments, but Bordeaux mixture is preferable for the later applications unless the risk of infection is slight: if an oxychloride or oxide is to be used, two or three supplementary sprays should be given. The proprietary oxides authorized for use as downy mildew-preventives are cupra colloidal copper, Sandoz copper, Maag copper oxide, and roravit, while the oxychlorides comprise bordofix, bordoxex, coprantol C and cuprenox pastes, Grisard oxychloride, herka oxychloride paste, Rohner oxychloride, cupra 32 and 50 per cent. oxychlorides, oxycuivre, veravit, and viricuivre.

Richards (M. C.). **Spraying Grapes to control black rot.**—*Plant Dis. Reptr,* xxx, 12, p. 464, 1946. [Mimeographed.]

The most serious disease of cultivated grapes in New Hampshire is black rot (*Guignardia bidwellii*) [*R.A.M.*, xxiv, p. 270; xxv, p. 201], unsprayed vines in home gardens often becoming a total loss as a result of infection. Comparative spraying tests in 1946 with Bordeaux mixture (6–6–100), fermate (2–100), zerlate (2–100), and phygon (2,3, dichlor-1,4-naphthoquinone, 1–100), using three applications at 250 to 300 lb. pressure, and adding 50 per cent. wettable DDT (1–100) in the first two, showed that all the materials gave good control of the disease on the foliage but not always on the fruit. Phygon caused slight to severe flecking

of the fruits on all the varieties used. Fruit losses amounted to 10 to 25 per cent. on the Brocton, Van Buren, and Yates varieties, while fruits of Kendaia, Worden, Fredonia, and Geneva seedlings 11987 and 16241 showed only a trace of infection, and Concord seedless, and Minnesota seedlings 45 and 69 none.

PRICE (W. C.). **Measurement of virus activity in plants.**—*Biometr. Bull.*, ii, 5, pp. 81–86, 1946.

The author summarizes some important contributions to the biometrical study of plant viruses, most of which have been noticed from time to time in this *Review*.

PIRIE (N. W.). **The viruses.**—*Annu. Rev. Biochem.*, xv, pp. 573–592, 1946.

The present position of virus research is briefly surveyed in terms of three questions, namely, (1) whether viruses can be considered a group that is chemically and physically distinguishable from all other biological material; (2) whether there are general chemical differences between plant, bacterial, and animal viruses; and (3) the feasibility of virus classification.

It is concluded from a perusal of the relevant literature (listed in a bibliography of 89 titles) that no chemical differentiation of viruses from normal tissue components is practicable in the light of present knowledge; they are recognizable only by their ability to induce definite physiological changes in the host, and not by their own intrinsic properties. It is of interest to note that the viruses are not known to infect gymnosperms, pteridophytes, and bryophytes.

So many factors influence the direction of plant and animal virus research that differences in the results may not reflect genuine divergences between the two virus groups. Parallel studies on the viruses attacking plants, bacteria, and animals should be carried on wherever circumstances permit.

All the classification systems hitherto proposed are open to various objections arising from imperfect knowledge of their morphological, chemical, and physical attributes.

Other sections of the review are concerned with the tobacco mosaic virus, other plant viruses, associations between a virus and its host, and general methods of investigation.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **An electron microscope study of two strains of Potato X virus.**—*Amer. J. Bot.*, xxxiii, 9, pp. 740–742, 1 fig., 1 graph, 1946.

Examined under the electron microscope, Larson's potato virulent ring spot and potato latent mottle viruses [*R.A.M.*, xxiv, p. 244] were found to be indistinguishable in shape and size. The lengths of a high proportion of the particles ranged from 500 to 600 mμ. The particles are apparently flexible, unlike the rigid constituents of the tobacco-mosaic virus [ibid., xxv, p. 476], and are often variously curled. The similarity in appearance of these two strains of potato virus X is in conformity with the view that mutations are not ordinarily accompanied by perceptible changes in the aspect of the virus particles.

WILLIAMS (P. H.), SHEARD (ENID), READ (W. H.), SELMAN (I. W.), & GROSSBARD (E.). **Plant diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1945*, pp. 25–65, 1946.

In the section of this report [*R.A.M.*, xxv, p. 290] dealing with *Verticillium* wilt of tomatoes and cucumbers (pp. 26–31), P. H. WILLIAMS presents experimental evidence indicating that infection of Potentate tomatoes by *V. albo-atrum* was checked by warm, moist conditions and that by *V. dahliae* somewhat less so. High soil moisture somewhat delayed the onset of attack by *V. albo-atrum* but the final intensity of the disease was not reduced. Low temperatures favoured cucumber

(variety Butcher's Disease Resister) infection by *V. albo-atrum*, and cross-inoculations proved that this fungus from tomato can infect cucumber and vice versa.

Work by ENID SHEARD (pp. 31–42) showed that the strain of *Didymella lycopersici* [ibid., xxiv, p. 480; xxv, p. 371] that affects outdoor tomato fruits does not attack the stems of glasshouse plants. Experiments in collaboration with O. B. ORCHARD demonstrated that the spores can be air-borne and were frequently trapped on agar plates both outdoors and in greenhouses. Of various chemicals tested for their ability to kill the fungus spores in the soil, ethyl mercuric phosphate gave 100 per cent. kill at 1 in 20,000 after being in contact with an equal weight of soil for one hour. Mercuric chloride (1 in 500), basic phenyl mercuric nitrate, and basic phenyl mercuric borate (both at 1 in 2,500 to 5,000) were also effective. It was noted that the toxicity of copper compounds to *D. lycopersici* spores was reduced in the presence of tomato juice. Soils treated with mercuric chloride solution (1 in 1,500) retained much of their fungicidal activity after leaching. The surface of soil treated with a 1 in 49 solution of 40 per cent. formaldehyde retained its toxicity to free *D. lycopersici* spores up to seven days after treatment, but lost it after 14, while soils treated with ethyl mercuric phosphate solutions remained toxic for much longer periods. Spores inside pycnidia were not affected by contact with treated soils. Free spores, but not those in pycnidia, were killed by one hour's exposure to formaldehyde vapour produced by adding 4 fluid oz. 40 per cent. formaldehyde to 2 oz. potassium permanganate per 1,000 cu. ft. of house. This method is satisfactory for destroying free spores left in houses after the tomato stems have been removed. A cheaper and equally effective method is to spray the atmosphere with formalin solution (1 in 49) through a fine nozzle at the rate of 1,100 gals. per acre. Spores exposed on slides 24 hours after completion of spraying did not germinate.

Experiments by W. H. READ (pp. 42–46) on the chemical control of *D. lycopersici* showed that when tomatoes were planted in steam-sterilized soil (in a glasshouse) inoculated with the fungus, 31 out of 36 plants became infected. No infection occurred, however, in similar plots treated before planting with 2 per cent. formaldehyde (39·8 per cent. commercial solution) or 2 per cent. tar acid (emulsion containing 41 per cent. phenols) at 1 gal. per sq. yd. Some reduction in infection was given by 0·05 per cent. mercuric chloride solution at ½ gal. per sq. yd. used both before planting and for watering in the plants at the rate of 1 pt. per plant (3 plants infected out of 18); by watering in with malachite green solution 0·065 per cent. solution at 1 pt. per plant (11 infected out of 36); and by treating the soil with malachite green solution 0·065 per cent., 1 gal. per sq. yd., before planting (10 out of 36). A delay of 12 days between treatment and planting in the case of formaldehyde and tar acid may perhaps have influenced the results on these plots.

Work by I. W. SELMAN on tomato virus diseases (pp. 46–55) indicated that unduly heavy dressings of sulphate of potash tended to increase mosaic incidence [ibid., xxiii, p. 45] in Potentate plants inoculated with the yellow strain of tobacco mosaic virus. Evidence also indicated that plants grown with potash at a low level, but not low enough to induce deficiency symptoms, might, in some cases, show resistance to systemic invasion by tobacco mosaic virus. Potash did not appear, however, to be the factor of primary importance in this connexion. In experiments with mixed fertilizers plants receiving 2·5 gm. blood, 10 gm. superphosphate, and 1·25 gm. potassium sulphate per 6-in. pot showed the highest resistance to mosaic. The addition of lime tended to increase susceptibility except where peat was used in the compost. Tree tomatoes (*Cyphomandra* sp.) inoculated with potato virus X developed a regular mottling on some of the lower leaves and on other leaves as they matured. After inoculation with tobacco mosaic, local lesions appeared more rapidly and in greater numbers on *Datura stramonium* (especially on the cotyledons of young plants) than on *D. tatula*. Systemic necrosis, however, tends to develop

rapidly in the latter, often with a fatal result, whereas in the former systemic infection may not occur.

Preliminary studies by E. Grossbard (pp. 55–65) showed that *Aspergillus clavatus* was antagonistic to *Bacterium carotovorum* [*Erwinia carotovora*], to a non-virulent strain of *Bact. viridilividum* [*Pseudomonas viridilivida*], and to *Phytophthora cryptogea*, and all were sensitive to pure clavatin. *A. clavatus* grew well on sterilized fresh wheat straw with and without the addition of glucose, and produced an antibiotic, presumably clavatin [ibid., p. xxiii, 267]. The water extracts of this medium after 14 days' growth of *A. clavatus* were active against the same three organisms. The percentages of damping-off of tomato seedlings caused by soil inoculation with *P. cryptogea* were 48·7 and 26·2, respectively, when 30 and 60 gm. autoclaved fresh wheat straw inoculated with *A. clavatus* were incorporated in the soil, and 21·6 and 13·9 with the addition of glucose; percentages in the controls ranged from 84 to 93·6. Little antibiotic was produced when the fungus grew on composted wheat straw.

O. Owen, dealing with chemical problems (pp. 80–85), adduces evidence showing that three or more sprayings with a 2 per cent. solution of Epsom salts [magnesium sulphate] will prevent yellowing of tomato plants in magnesium-deficient soil; application of the salt as a base-dressing before planting delayed the appearance of the symptoms for three or four weeks and reduced their severity [ibid., xxv, p. 586].

Omission of boron [ibid., xx, p. 554] caused the leaves of Cheshunt Early Grant lettuces to begin to lose colour within ten days. Chlorosis progressed in the older leaves until definite areas were nearly white. The veins retained most of their colour, even when, in many instances, the leaf was almost dead. The heart remained green for some time, but eventually chlorosis and necrosis developed and the plant died. General stunting was well marked and root growth very limited. Omission of iron appeared to have little effect on the roots; there was some foliar crinkling, loss of colour, and development of grey bloom; necrotic areas developed near and upon the midrib, particularly on the upper side near the base. Magnesium omission produced serious stunting of the plant and reduction of the roots. The foliage was pale, especially the lower leaves, on which necrotic areas appeared. The affected leaves were asymmetrical. Manganese deficiency caused stunting, a grey bloom on the lower side of the leaves, and small, well-defined, necrotic spots near the margins. Irregular necrotic areas developed on the midribs, and they were sometimes hollow. There was some distortion and asymmetry.

Station fédérale d'essais viticoles et arboricoles et de chimie agricole, à Lausanne et à Pully. Rapport d'activité 1945. [Report for 1945 on the work of the Federal Viticultural, Arboricultural and Agricultural Chemistry Experiment Station at Lausanne and Pully.]—*Annu. agric. Suisse*, xlvii, 8, pp. 741–842, 1946.

M. Staehelin, in charge of the section of physiology and plant protection (pp. 754–769), reports as follows on the various projects undertaken during 1945 [cf. *R.A.M.*, xxv, p. 153]. Thanks to favourable weather conditions, namely, a warm spring permitting early ripening of the winter spores of the fungus and rapid leaf infection, and persistent drought conducive to the subsequent spread of the pathogen through the tissues, *Pseudopeziza tracheiphila* again extended its range, appearing in hitherto unaffected vineyards [ibid., xx, p. 515]. Reasonably good control was obtained in experiments in which the normal spraying schedule (against downy mildew [*Plasmopara viticola*]) was preceded by two applications of 2 per cent. Bordeaux mixture, the first on 26th April and the second on 8th May.

Under suitable environmental conditions grey mould (*Botrytis cinerea*) may occasion heavy reductions in grape yields [ibid., xvi, p. 152], and experiments were accordingly conducted to determine the possibility of its control on the highly susceptible Seibel 5455 variety. Three applications of 0·75 per cent. organol (a

sulphur-containing product), 0·5 per cent. liquid tumex (oxyquinoline) plus 0·2 per cent. M.G. wetter, and tumex dust on 10th and 25th July and 15th August reduced the amount of the rot from 40 to 18, 19, and 33 per cent., respectively, while a degree of protection was also incidentally conferred by insecticidal treatments on the first two dates with 1 per cent. nicotine plus 0·1 per cent. wetter or 0·5 per cent. Bordeaux plus 1 per cent. nicotine and 0·2 per cent. wetter (30 and 27 per cent., respectively).

A 0·5 per cent. tumex solution again gave excellent control of 'coître' (*Coniothyrium diplodiella*) [ibid., xxv, p. 153], both on experimental plots where the grapes were artificially infected and following hail showers in three vineyards. In the former series its efficacy was rated at 91 and in the latter at 89 per cent. in a scale from 0 to 100.

The dry summer of 1945 did not favour the development of apple scab (*Venturia inaequalis*), but spraying experiments in three localities indicated that 'reserve' applications of 6 per cent. carbolineum plus 2 per cent. copper oxychloride on 20th March equalled or excelled the standard dormant treatments followed by a pre-floral application of lime-sulphur.

Equally good control of cherry shot hole [*Clasterosporium carpophilum*: ibid., xxiii, p. 349] was secured in a preliminary trial with a 'reserve' spray of 1 or 2 per cent. copper oxychloride at bud-burst on 21st March as with the standard schedule of 1·5 per cent. lime-sulphur plus 0·3 per cent. copper oxychloride before flowering (4th April), 0·75 per cent. organol or 1 per cent. lime-sulphur plus 0·1 per cent. iron sulphate after petal-fall (5th May), and 0·5 per cent. amarex on 1st June, the percentage of damaged leaves on 19th July ranging from 9 to 12 on the treated trees compared with 40 on the controls.

Peach leaf curl (*Exoascus* [*Taphrina*] *deformans*) proved amenable to dormant treatments of 1·5 per cent. dinitrocresol plus 1 per cent. copper oxychloride. The value of a dormant treatment with 1 per cent. lime-sulphur against plum pockets (*T. pruni*) was confirmed.

In cross-inoculation experiments with *Monilia cinerea* [*Sclerotinia laxa*], the agent of heavy damage to fruit-trees, especially sour cherries, positive results were obtained on (sweet) cherry blossoms in 48, 51, 35, and 50 per cent., respectively, of the tests with conidia from mummified fruits of peach, cherry, plum, and myrobalan [*Prunus divaricata*]. Sour cherry blossoms reacted positively in 50, 46, 48, and 39 per cent., respectively, of the tests with conidia from peach, apricot, plum, and *P. divaricata* mummies. In the case of apricot, however, only one flower out of 400 inoculated in 18 tests with conidia of diverse origins was attacked by the fungus, which penetrated as far as the peduncle.

Bordeaux mixture (1 per cent.) copper oxychloride (viricuivre), and copper oxide (Sandoz copper), applied on 11th June and 16th July, were more effective in the control of walnut anthracnose (*Marssonina juglandis*) [*Gnomonia leptostyla*: ibid., xxii, p. 117] than 1 per cent. lime-sulphur. The numbers of spots per leaf on the copper- and lime-sulphur-treated trees were 13 and 28, respectively, and the percentages of fallen fruits 5 and 31, respectively, compared with 127 spots and 82 per cent. fallen fruits on the controls.

Apricot die-back assumed a severe form in the canton of Valais in 1944 and 1945. The disorder appears to be occasioned usually by wounds of all sorts, the intervention of fungi, notably *Valsa* spp. [including *V. cincta*: ibid., xv, p. 447], apparently being generally secondary.

The following conclusions are drawn from experiments in the disinfection of vegetable seeds against collar and root rots and the like. The copper compounds, copper carbonate, graminon [ibid., xxvi, p. 11], Sandoz copper, and Maag 5367, were generally satisfactory, but in cases of heavy contamination, notably by species of *Penicillium*, their efficacy was much reduced. The mercurials, ceresan,

zyma 3, abavit B, tillantin R, and prosat, were more thorough in their protective action and less dependent on the extent of seed infection. Travacide, a product with an oxyquinoline base, controlled damping-off of sugar beet at 0·1 per cent. (ten minutes' immersion), but not at the recommended 0·05 per cent. In general, the copper compounds do not significantly impair germination or growth, but caused marked injury to the Bon Jardinier and Enfant de Mt. Calme haricot bean [*Phaseolus vulgaris*]. The seeds tested fell into two categories in respect of their reaction to mercury treatments, radish, pea, cucumber, chicory, and haricot beans being tolerant (except that prosat injured the last-named) and lettuce [ibid., xviii, p. 228], onion, cabbage, celery, carrot, and tomato sensitive, especially to ceresan; zyma 3 is non-toxic. Among the yield increases over the controls obtained by seed disinfection were 33, 59, and 51 per cent., respectively, for Nantaise carrot, Best of All tomato, and Romaine lettuce treated with copper carbonate, 100 per cent. for Best of All tomato with Maag 5367, and 31 per cent. for Marmaude tomato (zyma 3).

Steaming was the most effective method of soil sterilization in Viroflay spinach and Reine de Mai lettuce frames, increasing the yields by 77 and 47 per cent., respectively. The dense cropping induced promoted attacks of lettuce mildew (*Bremia lactucae*).

G. Trivelli's studies in the section of anti-parasitic products on the physical properties of the principal types of copper-containing fungicides (pp. 817–821) showed that Bordeaux mixture surpassed all others in adherence and persistence on vine leaves. The adherence of the copper oxides was rated between 66 and 98 per cent. and their persistence at 26 to 33 in a scale where 100 represents the performance of Bordeaux mixture. The corresponding figures for the copper oxychloride dusts were 60 to 95 and 4 to 25 per cent., respectively, and for the same compounds in paste form 36 to 67 and 18 to 27 per cent., respectively.

Eastham (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B.C. Dep. Agric.*, *1942*, pp. X53–X59, 1942; ibid., *1943*, pp. R59–R64, 1943; ibid., *1944*, pp. S57–S65, 1944; ibid., *1945*, pp. V66–V71, 1946.

In the first of these reports [cf. *R.A.M.*, xx, p. 5] it is stated that Douglas firs [*Pseudotsuga taxifolia*] all round Kootenay Lake, British Columbia, suffered serious defoliation as a result of infection by *Melampsora albertensis* [ibid., xxv, p. 145]. The disease was also severe sporadically at Kamloops. Though not new to British Columbia, the occurrence of the rust in such a severe epidemic form was unusual. Serious tipburn and leaf-spotting were caused to greenhouse plants in Victoria by coke fumes, fuchsias and calceolarias suffering the most damage.

In the second report a serious outbreak of bean rust (*Uromyces appendiculatus*) [ibid., xx, p. 5] during 1943 in the Matsqui District on Kentucky Wonder is reported, the yield being halved in some fields. The aecidial stage was abundant on 15th July and the uredosori appeared a few days later. Ripening cherries, particularly the Bing and Centennial varieties, in several orchards at Boswell were attacked by twig blight (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*], infection reaching up to 25 per cent. On p. R64 the assistant plant pathologist, W. R. Foster, reports that the Vetomold 121 tomato proved resistant to leaf mould (*Cladosporium fulvum*) [but see ibid., xxvi, p. 8], and had, in 1943, replaced 90 per cent. of greenhouse varieties grown on the coast.

In the 1944 report it is stated that bean rust was less destructive in the Matsqui District than in 1943, but was quite severe though the variety mainly grown had been changed to Blue Lake. Seed from two resistant varieties obtained from the United States gave plants that remained almost unaffected though growing in close proximity to others heavily diseased. Freedom of potatoes from ring rot (*Corynebacterium sepedonicum*) [ibid., xxvi, p. 8] is attributed to quarantine measures, the ring-rot regulations passed in 1942 and 1943, the use of certified

seed, and a publicity campaign. A strawberry crown blight, the cause of which is unknown, caused an estimated loss of 25 to 30 per cent. in the Fraser Valley. The chief symptom was the death in spring of all or most of the foliage, many of the affected plants reviving, however, in July.

In the 1945 report it is stated by W. R. Foster that during the year potato bacterial ring rot was found in the crops of six commercial and three home growers in the Courtenay area. Intensity was low, except in one instance. In August 35,469 peach trees in Osoyoos and Oliver were examined for western X-disease [ibid., xxi, p. 259; xxiv, p. 5]; only 1·4 per cent. were found to be affected although all the varieties grown are susceptible. At least two orchards were seriously affected but commercial production as a whole has not decreased in the area.

Leach (E. W.). **Trinidad and Tobago Administration Report of the Director of Agriculture for the year 1945.**—20 pp., 1946.

In the section of this report [cf. *R.A.M.*, xxiv, p. 7] dealing with plant pathology (pp. 15–17), C. A. Thorold states that during 1945 check blocks of cacao counted in Tobago showed no unusual increase in the incidence of witches' brooms [*Marasmius perniciosus*: ibid., xxv, p. 296], although the control gangs which previously had removed all brooms were withdrawn. The very low incidence of pod infection in Tobago, as compared with the considerable pod losses in Trinidad, was confirmed. Cacao pink disease (*Corticum salmonicolor*) [cf. ibid., xviii, pp. 93, 156] was destructive in the Mausica area, recent plantings of clonal rooted cuttings and budded seedling stocks being seriously affected. There was also much die-back, not attributable to fungi, and *M. perniciosus* was also present. The presence of these three diseases in a block of exceptionally uniform cacao made this site a very suitable one for spraying experiments, which were started in May, maintained for three months, and resumed in September. Fortnightly applications of Bordeaux mixture or bordinette completely controlled pink disease and were associated with a statistically significant reduction in die-back.

The intensive survey of cacao virus disease [ibid., xxvi, p. 48] aided by a grant of $3,500 from Cocoa Subsidy Funds was continued, bringing the total of trees examined in the Santa Cruz Valley to 17,000, of which about 2,000 showed virus symptoms.

Bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*) [ibid., xxiii, p. 327] continues to be the chief limiting factor in tomato cultivation. The causal organism is apparently common in the local soils, the first crop of tomatoes on 'new' land sometimes becoming affected.

In 1940 and 1941 blocks of different trees were planted in two localities in an attempt to find a substitute for Bocare immortelle (*Erythrina glauca*), which is attacked by *Calostilbe striispora* [ibid., xxi, p. 281], as a shade tree for cacao. The evidence so far obtained indicates that *Peltophorum ferrugineum* is a suitable substitute when a high canopy is not required. Where the cacao trees become relatively tall, *Schizolobium excelsum* or *Parkia roxburghii* should be tried. *Bravaisia integerrima* with a less extensive canopy made excellent growth on very wet land, and appears to be suitable.

Other investigations were made into cabbage soft rot (*Bacillus carotovorus*) [*Erwinia carotovora*] and black rot (*X. campestris*), a root disease of rice resembling 'man rice' of British Guiana [associated with *Gibberella fujikuroi*: ibid., xiv, p. 217], and sweet potato black rot (*Ceratostomella fimbriata*).

Science for the Farmer.—*Rep. Pa agric. Exp. Sta., 1945–6* (*Bull.* 480), 65 pp., 17 figs., 1946.

In this report [cf. *R.A.M.*, xxv, p. 253] it is stated that a new phase of cereal black rust [*Puccinia graminis*] has been discovered in Greece by P. Critopoulos

and identified by F. D. KERN and H. W. THURSTON, in which the spores usually found on grasses occurred on barberry leaves. This is the first report of such a condition in nature. O. E. STREET reports that Pennsylvania R5A tobacco combines resistance to mosaic and black root rot [*Thielaviopsis basicola*] with a high yielding capacity and other desirable characteristics. According to J. W. SINDEN it will soon be safe to introduce synthetic compost into the mushroom [*Psalliota* spp.] industry. One large producer is extending his production as a result of the yields obtained in large-scale trials. Finished compost containing 1·8 per cent. potassium, corresponding to an addition of 14 lb. potassium chloride per ton to a mixture of two-thirds maize fodder and one-third straw, gave more mushrooms than a compost containing 1·6 per cent. Adding more potassium had no further effect on yield. Ammonium nitrate may be replaced by calcium cyanamide on an equivalent nitrogen basis. Optimum calcium cyanamide concentration was 30 lb. per ton of dry mixture. Prepared in ricks consisting of 8 tons maize fodder and 5 tons straw, the synthetic compost yielded as well as horse manure. It was easier to handle and cheaper.

In a survey by D. E. H. FREAR over 10,000 chemical compounds were found to have been tested for their fungicidal or insecticidal properties. These were studied statistically by means of punch-cards to determine the relation between chemical structure and toxicity, and the results are to appear in book form.

Of 35 nickel-bearing compounds tested by H. J. MILLER for fungicidal usefulness, 12 received an A rating as equivalent to Bordeaux mixture.

MILBRATH (D. G.). **Bureau of Plant Pathology.**—Ex *Rep. Dep. Agric. Calif., 1945* (*Bull. Dep. Agric. Calif.*, xxxiv, 4), pp. 213–227, 1945.

In this report [cf. *R.A.M.*, xxii, p. 12] it is stated that during 1945 peach rusty spot [ibid., xx, p. 311] was recorded for the first time in California. The discovery of this disease and peach wart [ibid., xxv, p. 566] illustrates the value of even casual surveys. For the prevention of the introduction and spread of virus diseases in stone-fruits inspection of dormant nursery stock is of no avail. Peach trees affected with wart virus develop normally except for the fruit; apricots may harbour the yellow bud mosaic virus [? peach yellow bud mosaic: ibid., xxiv, p. 65], yet show no sign of infection. Mosaic in apricots [? peach mosaic virus: ibid., xx, p. 370] often produces no symptoms until the second year's foliage. It is suggested, therefore, that some means other than visual inspection is necessary for detection of viruses in nursery stock. Rusty spot was found at Beaumont in Riverside County, Acton in Los Angeles County, and Gordon Valley in Solano County, in all cases on five-year-old Rio Oso Gem trees. At Beaumont, about 80 per cent. of the fruit was severely spotted.

Vines of wine grape varieties, particularly Alicante and Carignane, in a 158-acre vineyard near Gilroy, Santa Clara County, showed a mosaic-like condition [ibid., xxv, p. 201] which had been present for some years, consisting of a conspicuous mottling of the foliage accompanied by a general distress of the whole vine. Several hundred vines were affected, mostly in scattered groups.

The Agricultural Commissioner of San Joaquin County continued the campaign for the eradication of chestnut trees affected by blight (*Endothia parasitica*) [ibid., xxii, p. 12; xxv, p. 15] in his area; all chestnut trees in the three infected plantings showing the presence of the fungus were removed, regardless of the degree of infection.

R. C. BAINES states that Elberta, Lovell, and Muir peach trees are seriously affected by yellow bud mosaic. The symptoms may affect only certain branches or the entire tree. The virus also affects almonds and apricots but not seriously, apparently, though these may be a source of infection for peaches. Before 1945, the condition was found only in the Winters area, but during that year it was also

noted near Vacanille and Fairfield. In 1944 all the affected trees in two orchards were destroyed. Examination in 1945 revealed one infected tree in one of these orchards and seven in the other. This and the grouping of infected trees suggest that the disease spreads slowly. Experimental evidence indicated that a bacterium isolated from stem cankers on perennial nightshade (*Solanum douglasii*) was a strain of *Corynebacterium michiganense* [ibid., xxiii, p. 414] and when inoculated into tomato plants it showed high pathogenicity.

G. L. Stout states that the Federal, State, and County Co-operative peach mosaic [ibid., xxiv, pp. 237] project was continued for the tenth successive year. For all counties the total number of new cases was 1,062; the figure was below that of any of the previous years and in striking contrast to 1937 [ibid., xvii, p. 798]. There has been no spread beyond the originally infected area. During the ten seasons, 103,120 affected trees have been found on 3,620 properties. Inspection at blossom-time enables the virus to be detected by petal symptoms, an advantage in varieties like Rochester in which leaf symptoms become masked and allow them to escape detection later.

The same writer also states that Pierce's disease of the vine [ibid., xxvi, p. 42] has been found in nearly all counties in which grapes are grown commercially. It is spread naturally by leafhoppers [loc. cit.] but not by the common grape leafhopper *Erythroneura comes*. For some years it has been most prevalent and destructive locally from southern Merced County southwards; it is most heavily concentrated in the southern and central parts of the San Joaquin Valley. The only known method of suppression is the removal and destruction of the affected vines.

Robak (H.). **Det biologiske grunnlag for dannelsen av ondartete svulster hos planter og dyr.** [The biological basis for the formation of malignant growths in plants and animals.]—*Naturen, 1944*, 2, pp. 41–57, 4 figs., 1 graph, 1944. [Received February, 1947.]

This is a summary and discussion of some important contributions made between 1915 and 1942 to the biology and biochemistry of tumour formation in the plant and animal kingdoms, with special reference to the analogies and differences between crown gall (*Phytomonas* or *Pseudomonas* [*Bacterium*] *tumefaciens*) and cancer [*R.A.M.*, xxiii, p. 8 *et passim*; xxv, p. 293].

Office International du Cacao et du Chocolat. Conférence Internationale du Cacao. Londres 1, 2 et 4 octobre 1946. Compte Rendu Officiel. [International Bureau of Cacao and Chocolate. International Cacao Conference. London, 1st, 2nd, and 4th October, 1946. Official Report.]—155 pp., 14 graphs, 1946.

The third meeting of the International Cacao Conference, held in London on 2nd October, 1946, was concerned with research into the prevention of disease, selection of types, replanting, and other matters connected with cultivation (pp. 87–106). Sir H. Tempany outlined the disease and research position in West Africa and the West Indies. In the former country capsid bugs, principally *Distantiella theobroma* and *Sahlbergella singularis*, and swollen shoot unite to form a pathological complex which has already devastated extensive areas in the Gold Coast and also occurs in Nigeria and the adjacent French territories [*R.A.M.*, xxvi, p. 97]. Since 1943 active steps have been taken to combat swollen shoot, and the work of the West African Cacao Research Institute [ibid., xxv, p. 546] then established has demonstrated the efficacy of the timely eradication of diseased trees and the feasibility of replanting devastated areas provided similar measures for the removal of infected material are concurrently adopted.

Witches' broom (*Marasmius perniciosus*) is the limiting factor in cacao production in Trinidad, where it has caused the widespread destruction or decline of the

crop and necessitated the exclusion from cacao cultivation of lands marginally or submarginally adapted to this purpose. The main hope of control appears to lie in the introduction of resistant forms discovered on expeditions to South America and now being intensively propagated with a view to replanting under a scheme of subsidies instituted by the Trinidad Government [ibid., xxiv, p. 140]. Every effort must be made to prevent the introduction of witches' broom into West Africa, in the British territories of which stringent plant quarantine regulations are already in force, while discussions are proceeding with the authorities in the adjacent French and Belgian possessions on the question of mutual collaboration in the matter.

Mr. J. West, Senior Scientific Officer at the West African Cacao Research Institute, gave an account of its organization, functions, and achievements to date, including a brief progress report on the swollen shoot position, of which mention has already been made.

Mr. D. H. Urquhart, Director of Agriculture, Gold Coast, summed up the situation as regards the swollen shoot and its control in the Colony [ibid., xxv, p. 253], where it is estimated that roughly 101,800 acres are affected and an energetic campaign for the elimination of the virus is in progress.

Mr. A. G. Beattie, Director of Agriculture, Nigeria, defined the foremost object of a projected survey of cacao farms as a search for swollen shoot [ibid., xxv, p. 494], while another of its aims is the continuance of propaganda and instruction on black pod (*Phytophthora palmivora*) control.

Professor R. E. D. Baker briefly summarized the present situation in respect of the selection of high-yielding cacao strains for Trinidad and Grenada referred to above, and made a few observations on the mild virus disease recently detected in the former island [ibid., xxv, p. 296] and on witches' broom.

Guyot (A. L.), Massenot (M.), & Saccas (A.). **Considérations morphologiques et biologiques sur l'espèce Puccinia graminis Pers. sensu lato.** [Morphological and biological considerations on the species *Puccinia graminis* Pers. *sensu lato.*]—*Ann. Éc. Agric. Grignon*, Sér. 3, v, pp. 82–146, 1945–1946.

This is an expanded account of work already noticed from another source [*R.A.M.*, xxv, p. 389].

McKay (R.) & Loughnane (J. B.). **Observations on Gibberella saubinetii (Mont.) Sacc. on cereals in Ireland in 1943 and 1944.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxiv, 2, pp. 9–18, 1 pl., 1945. [Received December, 1946.]

During the spring of 1943, failures of wheat braírds, due to the use of seed infected by *Gibberella saubinetii* [*G. zeae*: *R.A.M.*, xxii, p. 349], were rather common in Eire, particularly in the February, March, and April sowings. Many ungerminated grains from affected fields were permeated with the fungus while the plants were small and chlorotic, with poorly developed root systems. Many of the roots were brown and rotting, and some of the seedlings were dead or dying. Inoculation of these plants under warm, moist conditions usually caused conidia of *G. zeae* to develop. Seedling blight of wheat was present in 1943 in the counties of Limerick, Clare, Westmeath, Offaly, and Dublin, and this phase of the disease is also one to be reckoned with, particularly after wet years when scabbed wheat (i.e., wheat bearing ascospores of *G. zeae*) has been prevalent. Plants killed by seedling blight may cause infection of remaining plants, resulting in ear blight. Samples of scabbed plants were received from ten counties, of which Mayo, Monaghan, Meath, Dublin, Kilkenny, and Waterford were new records for the perithecial stage. There was no record of any serious reduction in yield from the ear-blight and scab stages. One sample of barley was received which was heavily infected with the perithecial stage, this being the first record of scab on barley in Ireland.

In the spring of 1944, only one case of seedling blight due to *G. zeae* [on wheat] was identified, the affected specimens coming from Co. Monaghan. Wheat ears with perithecia were received from nine counties, Donegal being a new record, and bringing the total for the past three years to 17. Specimens from three counties showed only the *Fusarium* stage, but perithecia in many cases developed (on the stems) when the culms were cut and placed in water at room temperature.

When healthy and infected wheat grains were sown together in pots of sterilized soil in an unheated greenhouse the infected did not germinate, whereas all the healthy grains gave normal plants, and there was no evidence of fungal spread in the soil. On 6th April, 1943, a nine-day-old culture of *G. zeae* was mixed with the top 2 in. of sterilized soil in pots. They were sown with 240 grains of Queen Wilhelmina wheat surface-sterilized for five minutes in mercuric chloride solution (1 in 1,000). Of the 232 plants which appeared, after six weeks 64 per chlorotic and 6 had died from a severe root rot. The dead seedlings produced perithecia and ascospores. The chlorotic plants recovered, but later on *G. zeae* was readily obtained from dark brown areas in their outer leaf sheaths near soil-level. Later, these plants were attacked by *Erysiphe graminis*. Examination of dead tillers in October showed the basal parts to be completely rotted, perithecia of *G. zeae* being present on these and other tillers, the heads of some of which produced no grain, their bleached ears resembling those of plants affected by *Ophiobolus graminis*. Controls in uninoculated, sterilized soil remained healthy.

On 10th June, 60 grains each of Pajbjerg and Desprez wheat were sown in pots of sterilized soil, which were then sprayed with an ascospore suspension of *G. zeae*. No seedling blight developed, though the plants became attacked by *E. graminis*. The bases of several of the plants in October bore perithecia of *G. zeae* although no symptoms had been apparent previously.

In July, 200 grains of each of the wheat varieties Atle, Pajbjerg, and Queen Wilhelmina steeped for 30 minutes in an ascospore suspension of *G. zeae* were sown outside, the grain being sprayed with the spore suspension before it was covered over with soil. No sign of infection appeared. At heading out, however, the number of heads in the inoculated Atle row was considerably less than in the control row, and by the end of September some of the tillers were dead. The rotted basal parts produced perithecia and ascospores after incubation.

Other experimental evidence indicated that soil which has produced diseased plants does not retain its infectivity until the following season, even when the remains of infected plants are added to it. The fungus also grew freely, under incubation, on the anthers of wheat plants sprayed with an ascospore suspension just before and during anthesis.

During August, in the centres of six of ten bundles of healthy wheat heads badly infected heads were placed. Four of the six and two without infected heads were frequently sprayed with water over a period of three weeks. After 45 days, in bundle 1 (heads green and in flower when diseased ears were inserted; sprayed) some of the originally healthy heads in contact with the diseased ones were affected and bound together by a weft of mycelium. No grain formed in the affected or healthy heads. In bundle 2 (heads ripe at inoculation; sprayed) a number of heads in contact with diseased ones were joined to them by a mycelial weft, and some grains in the newly attacked heads were infected. In bundle 3 (heads slightly green, grain well formed at inoculation; sprayed) the heads in contact with affected ones had become attacked, and the grains were shrivelled. In bundles 4 (heads nearly ripe, grain well formed at inoculation; sprayed), 5 and 6 (uninoculated heads; sprayed) 7 and 8 (inoculated and kept dry) and 9 and 10 (not inoculated but kept dry) healthy plants developed no infection.

Perithecia forming on the bases of plants which recover from seedling blight are a source of infection. High atmospheric humidity is necessary for the development

of ear blight, and if it coincides with the flowering period of the host, then the greatest damage is done. As wheat ripens, the ears become more resistant, but infection may spread in stooks if sufficient moisture is present. Abundant moisture is also essential for perithecial development.

SEMENIUK (W.). **Chromosomal stability in certain rust resistant derivatives from a T. vulgare × T. timopheevi cross.**—*Sci. Agric.*, xxvii, 1, pp. 7–20, 1947.

The need is pointed out for the production of a range of wheat varieties resistant to the constantly mutating strains of *Puccinia graminis tritici*. For this study F_5 and F_6 material selected in Australia from a cross between *Triticum timopheevi* and Steinwedel [*R.A.M.*, xix, p. 78] was used. The two species have different chromosome numbers and the object was to examine chromosomal behaviour in these lines, the original parents, and six commercial varieties, and to attempt to combine stability with resistance. Abnormalities in meiosis were analysed from anther smears, and rust resistance was measured by the degree of infection resulting from exposure to some 30 prevalent races of *P. graminis*.

Chromosome stability appears, from the correspondence between the percentage of meiotic abnormalities in parents and offspring, to be inherited. The winter strains derived from the original cross showed greater instability than the spring strains, but it was found possible to select lines among the progeny which combined chromosomal stability with rust resistance and other desirable characteristics. These lines appeared to be homozygous for leaf [brown] rust [*P. triticina*] resistance, but heterozygous for resistance to stem [black] rust. Line numbers 996 and 1011 were resistant to black rust, showed only a trace of brown rust, and had only 1·6 and 1·9 per cent. abnormal pollen, respectively. It is considered that the percentage of pollen abortion will be a useful guide to the breeder in enabling him to eliminate unstable lines.

CHEREWICK (W. J.). **A method of establishing rust epidemics in experimental plots.**—*Sci. Agric.*, xxvi, 11, pp. 548–551, 1 fig., 1946.

A stock of uredospores of the cereal rust [unspecified] is obtained by growing susceptible host plants, three or four together, in a 6-in. pot. At the short-blade stage they are dusted with a mixture of spores and talc (1:10) from a scent-spray type of duster, sprayed with a fine mist of water, and transferred for 24 hours to a chamber thoroughly wetted inside and out at a temperature of 10° to 15° C. They are then returned to a moderately cool greenhouse, and the spikes are removed as they appear. When the sori develop, spore collections are made every two or three days by tapping the plants over a smooth sheet of paper, 100 pots yielding over 400 c.c. spores. These dry spores can be stored at a temperature of 0° to 3° for as long as twelve months.

Field inoculations are made by dusting plants in the third or fourth leaf stage, using the same duster on a long handle and the spore-talc mixture. The talc provides nuclei for the condensation of moisture, giving a large number of small droplets over the leaf surface, instead of the natural few large drops on the margin, and favours the germination of the spores. Heaviest infections were obtained when inoculations were made on still evenings as the dew began to form.

GLYNNE (MARY D.) & MOORE (F. JOAN). **Eyespot and lodging of Wheat.**—*J. Minist. Agric.*, liii, 7, pp. 305–308, 2 pl., 1946.

During 1946, wheat lodging [cf. *R.A.M.*, xxiv, p. 184] was much worse than usual in southern England, but while much was due to luxuriant growth and inclement weather, crops weakened by eyespot (*Cercosporella herpotrichoides*) [ibid., xxv, p. 301] were often laid flat when heavier, but unaffected, crops remained standing. Eyespot has almost certainly increased in recent years and is expected to become

worse with the extended cereal cropping at present necessary. The disease increases with the frequency with which wheat and barley are grown on the same land [ibid., xxvi, p. 50].

The first wheat crop after grass generally shows little or no eyespot. At Rothamsted the second wheat crop after grass is also very little affected, but the third shows about 20 per cent. infected straws; this does not cause appreciable loss, but it may carry severe infection to the next crop. The rate at which the disease increases in different seasons and localities depends largely on the amount of moisture present.

Rotations with non-susceptible crops for at least two years are recommended. Good wheat crops can, however, usually be grown on infected land if one or more of the following conditions obtain: the season is dry, the land is well drained, short-strawed varieties, e.g., Jubilegem, are sown and properly manured, thin sowing is practised and weed control carried out, or when infected crops on fertile land are sprayed with sulphuric acid in early spring.

Gorter (G. J. M. A.). **Wheat stunt—a new cereal disease.**—*Fmg S. Afr.*, xxii, 250, pp. 29–32, 44, 4 figs., 1947.

In September, 1945, the author observed in the Transvaal stunted wheat plants with narrow, yellowish-green or chlorotic streaks along the leaf veins, a condition long known to the farmers as 'kroeskoring' ['curly grain']. The first streaks appear near the base of the second or third leaf, and on succeeding leaves cover a progressively larger area, until the whole length shows parallel rows of streaks. The streaks are generally about $\frac{1}{100}$ in. wide and from $\frac{1}{100}$ to $\frac{1}{8}$ in. long. In severe attacks they joined to form longer lines parallel to the veins. Fully streaked leaves were mostly very short and often showed bent or curled tips. The haulms remained short, but tillering was stimulated, with the result that affected plants were small and bunchy. Dwarfed plants gave only a few heads, and these were about half the normal length with only isolated grains or no seed. Bearded varieties generally showed some bent awns. Plants infected at an early age sometimes died prematurely. As a rule the affected plants were scattered about the fields.

Greenhouse tests showed that the condition, termed 'wheat stunt', was caused by the A form of the maize-streak virus (nomenclature of A. P. D. McClean in 'Some forms of streak virus occurring in maize, sugar-cane, and wild grasses': *Sci. Bull. Dep. Agric. S. Afr.*, in press) and transmitted by the leafhopper *Cicadulina mbila*. It is not seed-borne. So far the disease has been found only in areas where maize streak is known to be present, i.e., Lydenburg, Middelburg, Pretoria, Brits, and Rustenburg.

Of the wheat varieties tested, only Renown 461 and 723, Reward 632 and 546, Marquis 489, and Regent 580 appeared to be immune, though Bossiesveld 430 and Renown 570 showed only 0 to 15 per cent. infection.

The disease is particularly severe in early-sown and irrigated wheats. Wheat farmers in the bushveld areas and the 'bankenveld' are advised not to grow maize as a summer crop. If planting some maize for local use is unavoidable, the streak-tolerant Barberton strain of Hickory King should be used. Ploughed lands should be fallowed and cultivated clear of wild grasses before being planted with wheat. Flooding immediately after ploughing should cease. As the immune varieties are not very suitable for the Transvaal it is recommended that early wheat should be sown more thickly than usual, to minimize loss.

Brodie (H. J.) & Jones (J. F.). **The effect of changes of air pressure upon the germination of conidia of Barley powdery mildew.**—*Canad. J. Res.*, Sect. C, xxiv, 6, pp. 318–329, 4 diags., 2 graphs, 1946.

In a previous study on the germination in dry air of the conidia of *Erysiphe graminis hordei* [*R.A.M.*, xxv, p. 280] it was noted that atmospheric pressure had

some effect on germination. Consequently an apparatus was devised to study the effect of variations in pressure under controlled conditions. Two glass germination chambers were kept at a constant temperature of 18° C. by immersion in a cold water bath, and given the same conditions of light and humidity. One chamber was connected either to an aspirator or an air pump; the other was kept at atmospheric pressure. In each test fresh conidia were collected by shaking host plants infected with *E. graminis* race 8 over glass slides lying in a bell jar. Three slides were placed in each chamber, and the pressures set. At the end of three hours the spores were fixed, and the percentage germination recorded. The effect of pressure on the time taken in germination was observed microscopically by waxing inverted slides bearing spores on to two glass chambers, in one of which the pressure was regulated as before.

It was found that a reduction in pressure of not more than 200 mm. mercury increased the percentage of germinating spores, the maximum occurring at the 125 mm. below normal. A depression of between 250 mm. and 500 mm. caused a decrease to 90 per cent. of the normal, and further reduction caused a proportional decrease in germination down to nil in the region of 700 mm. below normal. This change of effect was regarded as due to the inadequacy of oxygen at the reduced pressures. Increase in pressure, while decreasing germination, gave no regularity in the results. Although more conidia germinated at low pressures than at atmospheric pressure in a three-hour period, after five hours the percentage germination was approximately the same in both. The authors suggest that rarefaction facilitates the elimination of carbon dioxide from the spore, which is an essential preliminary to germination.

Guyot (A. L.). **Études expérimentales sur les Uredinées hétéroïques réalisées au Laboratoire de Botanique de l'École Nationale d'Agriculture de Grignon (Seine-et-Oise) au cours de l'année 1944.** [Experimental studies on the heteroecious Uredineae conducted at the Botanical Laboratory of the National School of Agriculture, Grignon (Seine-et-Oise), during the year 1944.]—*Ann. Éc. Agric. Grignon,* Sér. 3, v, pp. 30–32, 1946.

With teleutospores of *Puccinia simplex* [*P. hordei*] collected on barley at Grignon in the summer of 1943 [*R.A.M.*, xxv, p. 389] and overwintered out of doors, the writer successfully inoculated *Ornithogalum umbellatum* [ibid., xx, p. 353] on 18th April, 1944, spermagonia appearing on the 26th, and aecidia maturing on 17th May. Two-rowed barley (*Hordeum distichum*) and winter barley reacted positively to inoculation with the resultant aecidiospores (uredospores erumpent on 31st May), but *H. murinum* was not attacked.

Positive results were obtained in tests at the same time with teleutospores of *Puccinia baryi* (Berk. & Br.) Wint. from *Brachypodium silvaticum* on barberry, and with probasidia of *P. graminis* from *Agropyron repens* on barberry, the aecidiospores produced on which attacked *A. repens* and rye with moderate severity and *A. caninum* mildly, but were innocuous to oats, wheat, and barley. All these collections were made in Eure-et-Loir.

Infection also developed on *Rumex crispus*, *Ranunculus bulbosus*, and *R. repens* inoculated with rusted straw of *Phragmites communis* from Seine-et-Oise; aecidia were formed on the first-named only. Microscopic examination of the straw also revealed probasidia of the *Puccinia phragmitis* [ibid., xxiii, p. 420] type.

Hagborg (W. F.). **Investigations on grey speck of Oats in Manitoba.**—Abs. in *Phytopathology*, xxxvii, 1, p. 8, 1947.

Pot experiments in 1944 confirmed the presence of grey speck [manganese deficiency] of oats in Manitoba [*R.A.M.*, xxiii, p. 99], and in subsequent field trials the application of manganese sulphate to the soil at the rate of 65 lb. per acre

resulted in an increased yield of 58 bush. per acre, the corresponding figures for application as a spray (9 lb.), as a 25 per cent. dust diluted with clay (8 lb.), and as a seed steep (9·5 lb.) being 24, 20, and 12 to 17 bush. per acre, respectively. In a replicated trial of 68 varieties in 1946, *Avena strigosa*, Black Mesdag, Ajax, Exeter, and Laurel were among the more resistant, while Victoria, Tama, Vicland, Bonda, Early Miller, Valor, Sixty-day, Erban, Trispernia, Mindo, Legacy, and Bond were susceptible. Varieties descended from Victoria showed a high degree of susceptibility, which is not fully linked, however, with resistance to stem and crown rusts [*Puccinia graminis avenae* and *P. coronata*, respectively].

RAPIN (J.). **Les charbons de l'Avoine.** [The smuts of Oats.]—*Rev. romande Agric., etc., 1947*, 1, pp. 1–3, 2 figs., 1947.

The economic importance of the loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]) is commonly underrated in Switzerland, where the crop reduction from these pathogens (chiefly the former) often amounts to 25 per cent. or so. In 1945 numerous fields were disqualified for seed production on account of their high proportion of smutted plants. From one such field in the canton of Neuchâtel, a batch of Pluie d'Or seed was procured for experimental purposes and sown on 1st April, 1946, after various treatments. On 28th July, the incidence of infection in the plots from seed immersed for 15 minutes in 1 per mille formalin or for 10 in hot water (53° C.) was nil, compared with 2·7, 1·4, 0·4, 1·9, 3·1, and 3·5 per cent., respectively, in those dusted with copper carbonate, zyma 3, ceresan, abavit, prosat, and graminon, respectively, and 4·2 per cent. in the control.

There was no significant reduction in the germinative capacity of seed immersed for ten minutes in water heated up to 53° (94 per cent. compared with 100 for the untreated), but at 55°, 60°, and 70° it sank to 80, 41, and 0 per cent., respectively. Exposure to dry heat at 70° did not materially impair germinability (92 per cent.), but the fungicidal efficiency of this process has not yet been tested.

NAGEL (C. M.) & SEMENIUK (G.). **Some mold-induced changes in shelled Corn.**—*Plant Physiol.*, xxii, 1, pp. 20–33, 4 graphs, 1947.

Pure cultures of nine fungi, namely, *Aspergillus flavus*, *A. candidus*, *A. niger*, *A. amstelodami*, *Penicillium palitans*, *P. chrysogenum* I and II, *P. rugulosum*, and *Mucor racemosus*, isolated from naturally moulded stored maize [*R.A.M.*, xxiv, p. 364] at the Iowa Agricultural Experiment Station, were grown for four weeks in the laboratory on steam-sterilized maize initially adjusted to a 32 per cent. moisture content. Analyses were made at weekly and bi-weekly intervals for modification in the amounts of water, organic matter, fat acidity, hydrogen-ion concentration, and water-soluble and -insoluble nitrogen. Seven of the moulds (*M. racemosus* and *A. amstelodami* failed to develop) were also grown on Czapek-Dox liquid medium to compare their carbohydrate-utilizing and acid-producing properties on this substratum with the changes they caused in maize.

P. chrysogenum I and II, *A. niger*, and *A. flavus* were the most active decomposers of maize organic matter, the losses due to these organisms within the month covered by the investigation ranging from 40 to 50 per cent. On Czapek-Dox the same fungi were initially the most rapid utilizers of glucose.

A positive linear correlation was established between the percentage loss in organic matter and the percentage of water (wet weight basis) in the mouldy maize. A 1 per cent. decrease in organic matter resulted in a 0·55 per cent. increase of water. The ratios between these two variables were 1:0·701 and 1:0·601 at the two- and four-week periods, respectively, of fungus development.

Fat acidities in the maize were increased by all the moulds tested, especially by the four above-mentioned, rapid decomposers of organic matter and by the slowly acting *M. racemosus* and *A. amstelodami*.

Linear correlations were observed at the early stage of fungus development, but not later, between the losses of organic matter and the changes in the amounts of water-soluble and insoluble nitrogen.

General agreement between the pH and (*a*) fat acidity of mouldy maize and (*b*) titratable acidity of Czapek-Dox medium was obtained with the several fungi.

SEMENIUK (G.) & WALLIN (J. R.). **The influence of climate on four leaf parasites of Zea mays in Guatemala.**—Abs. in *Phytopathology*, xxxvii, 1, p. 20, 1947.

Maize from the lowlands, highlands, and mountainous regions of Guatemala was planted in six parts of the country at altitudes between sea-level and 8,200 ft., with climates ranging from tropical to temperate, rainfall from 40 to 150 in., and maize maturity from three to nine months. Rust (*Puccinia sorghi*) [*P. maydis*] was the most prevalent and severe disease at 100, 4,900, 5,000, and 8,200 ft. above sea-level, and leaf blight (*Helminthosporium turcicum*) at 4,200 and 5,000. *Angiopsora zeae* [*R.A.M.*, xxiii, p. 316] occurred to a moderate extent at 3,200 ft. and in traces at 4,200, 4,900, and 5,000. *Phyllachora zeae* [*P. maydis*: ibid., xxi, p. 99] was present chiefly on the early maturing varieties in small amounts at 3,200 and 4,200 ft. and in traces at 5,000. The mountain maize maintained its resistance to rust at 8,200, 5,000, and 4,900 ft., but failed at 100. Late highland maize was severely rusted at 100, moderately at 8,200, and slightly at 5,000 and 4,900 ft., while the early ripening lowland types sustained heavy damage at 8,200, 4,900, and 100 ft. and a limited amount at 5,000. Two maizes proved highly resistant to *H. turcicum*.

GOIDÀNICH (G.) & SCARDOVI (V.). **Behaviour of Sphacelotheca sorghi, causal agent of covered smut of Sorghum, on sweet Sorghum cultivated in Italy.**—*Int. Bull. Pl. Prot.*, xx, 11–12, pp. 102M–104M, 1946.

Some concern was experienced in Italy about ten years ago as to the advance of the covered smut (*Sphacelotheca sorghi*) of sweet [saccharine] sorghum, which is widely cultivated for industrial purposes [*R.A.M.*, xviii, p. 517] and may sustain reductions of 30 to 40 per cent. of the crop from the disease.

Investigations in 1939–40 showed the Atlas variety to be the most susceptible of the 22 tested for their reactions to the pathogen, with 36, 40·5, and 24 per cent. infection, respectively, in two crops of the former and one of the latter year, Hasting, Honey, Japanese Ribbon, and Rosso Lombardo were resistant with 2, 1, and 0; 1, 1, and 4·4; 1, 6, and 2·4; and 3, 3, and 3·8 per cent., respectively, and several others, including Orange, Kansas, Planter, and Vienna, intermediate in their responses.

The influence of mineral fertilizers on the development of the smut was very variable: calcium cyanamide and superphosphate reduced the incidence of infection, while nitrates exerted no effect. Early sowing checked the appearance of the symptoms. Refractometric analysis of the ripe cane did not reveal any difference between healthy and diseased plants, but the weight of the latter was less than that of the former owing to stunting.

REUTHER (W.) & CRAWFORD (C. L.). **Effect of certain soil and irrigation treatments on Citrus chlorosis in a calcareous soil: I. Plant responses.**—*Soil Sci.*, lxii, 6, pp. 477–491, 3 figs., 1946.

In the spring of 1942, two-year-old Marsh grapefruit trees were set out in a split-plot design on a friable, calcareous soil in the Coachella Valley, California, for the purpose of evaluating the effect of various soil treatments and two moisture-levels on the prevalence of foliar chlorosis [*R.A.M.*, xvi, p. 313; xxvi, p. 102].

A striking interaction of season and moisture-levels was observed. During the summer the disorder was virtually absent from all the plots, irrespective of the amount of moisture supplied, but in the winter and early spring of 1943 it increased very markedly in the wet plots (irrigated with 2 to 3 acre-inches of water at weekly intervals throughout the summer and every two or three weeks in the winter months) and only slightly in the dry ones, receiving the normal amount of moisture, i.e., 2 to 3 acre-inches at two- to three-weekly intervals during the summer of 1942, every four to six weeks in that of 1943, and with a lapse of six to eight weeks between each treatment in the winter.

As regards the soil treatments, trees treated with a very heavy application of triple superphosphate (20 lb. per subplot, containing holes 6 by 4 by 2 ft. each planted with two trees), induced symptoms strongly suggestive of zinc deficiency [ibid., xxv, p. 559], which persisted even in the summer of 1943 at both moisture-levels. In no other treatment did this leaf pattern predominate. Very heavy applications of sulphur (60 lb. per subplot) resulted in poor growth, diminutive leaves, and foliar symptoms suggestive of salt toxicity. The admixture with the soil of chopped lucerne hay (80 lb. per subplot) greatly stimulated the growth of the trees and somewhat reduced the incidence of winter chlorosis.

Ehmke (H. F.). **Hot water immersion of Oranges to detect minute stings.**—*Fmg S. Afr.*, xxi, 249, pp. 838–842, 846, 1946.

A simple new method for the detection of minute punctures in the skins of oranges, which provide openings for decay, has been used with success in one or two large stations and can be adopted by those which have washing plants. After sorting and bleaching the fruit is washed in a hot bath. During this washing process the air inside the orange expands and in punctured fruits emerges as a stream of fine bubbles. The baths used were about 8 ft. by $4\frac{1}{2}$ ft. The oranges were plunged into the water from a slatted conveyer, paddled slowly across the bath, and taken out at the far side on a second conveyor. They remained in the water for about three minutes, floated across about three deep, and the source of any bubbles could be easily traced. The bath needs to stand in a good light, and the water should be as little disturbed as possible. The temperature of the bath must be carefully regulated and not allowed to scald the fruit; 43° to 47° C. gave good results, causing bubbling at about the middle of the bath. As an indication of the success of the method it was found that of the punctured fruit taken from the bath at one station 21·47 per cent., and at another 37·42, would have escaped detection by the usual examination. Buttonless fruits will not bubble unless a minute portion of the rind is removed and there is a distinct decrease in bubbling from wilted fruits.

Venkatarayan (S. V.). **Diseases of Coffee.**—*Mysore agric. J.*, xxv, 1–2, pp. 3–20, [1947].

The diseases affecting coffee in Mysore are listed, with notes on their economic importance, etiology, geographical distribution, host range, the life-histories of the causal organisms, and control.

Hendrickx (F. L.) & Lefèvre (P. C.). **Observations préliminaires sur la résistance de lignées de Coffea arabica L. à quelques ennemis.** [Preliminary observations on the resistance of strains of *Coffea arabica* L. to certain enemies.]—*Bull. agric. Congo belge*, xxxvii, 4, pp. 783–800, 1946.

The chief fungi attacking coffee at Kivu, Belgian Congo, are *Nematospora coryli* [*R.A.M.*, xxiii, pp. 63, 431], *Glomerella cingulata* [ibid., xxiv, p. 412; xxv, p. 154], *Cercospora coffeicola* [ibid., xix, p. 329], and *Botrytis cinerea* f. *coffeae* [ibid., xx, p. 60]; physiological die-back also occurs.

In a comparative study of the losses caused by different diseases on 20 lines growing in the selection gardens a specially trained team gathered at regular intervals before the ripe fruit was picked all diseased 'cherries' on and below the trees. These were classified in the field according to the most striking external symptoms. Trees killed by die-back were counted. At the beginning, middle, and end of harvesting selected berries were de-pulped by hand in the laboratory and the beans classified as floating, black, insect-punctured, discoloured, and healthy. The beans in the first four classes were then examined microscopically and placed in two categories as showing the presence or absence of the ascospores of *N. coryli*. In all, from 1939 to 1944 (excluding 1940), 1,108,308 fruits were examined.

The results obtained show that as regards fruit infection by *G. cingulata* the best results among the local strains were given by Local Bronze (e.g., L.B. 8, 4·23 per cent. average yield loss; L.B. 12, 4·89 per cent.); Kabare 16 was intermediate, with 12·6 per cent. loss. Among introduced strains, Jackson was the best (4·53 per cent.). The Mysore and Bourbon strains proved extremely susceptible and are not recommended for localities where this disease prevails. With regard to *C. coffeicola*, the local strains (Mibirizi, Local Bronze, Bourbon mayagese, and Kabare) were the best (0·37 to 5·91 per cent. loss), apart from Jackson (1·24). As regards die-back on the fruit the differences were inconclusive; mortality counts in the trees showed Local Bronze to be markedly resistant. Damage due to *B. cinerea* f. *coffeae* occurred only in 1939, and very slightly in 1944. The results of the laboratory examination of the 20 strains showed that of the 5,406 beans floated, some completely empty and others only partially so, 73 per cent. were parasitized by *N. coryli*, of 5,336 discoloured (black) beans 86 per cent. were infected, and among the 5,540 insect-punctured and discoloured beans 40 per cent. showed attack by the same fungus.

THIRUMALACHAR (M. J.) & NARASIMHAN (M. J.). **Studies on the morphology and parasitism of Hemileia species on Rubiaceae in Mysore.**—*Ann. Bot., Lond.*, N.S., xi, 41, pp. 77–89, 15 figs., 1947.

On the basis of the morphology of the sori and cross-inoculation experiments an attempt has been made to distinguish the various species of *Hemileia* occurring on Rubiaceae in Mysore, to which particular importance attaches in view of their potential role in the spread of coffee leaf rust (*H. vastatrix*). The prevalent confusion in the identity of the group is attributed to the close similarity in the shape of the uredospores, the dimensions of which have served as the sole criterion in the differentiation of the species. In addition to *H. vastatrix*, the species used in the studies were *H.* (*Uredo*) *gardeniae-thunbergiae* on *Gardenia thunbergia* [*R.A.M.*, xiv, p. 304], *H. thomasii* n.sp. on *Randia uliginosa*, *H. woodii* on *Vangueria spinosa* [cf. ibid., vi, p. 258], and *H. canthii* [ibid., xxii, p. 74] on *Plectronia parviflora* and *P. rheedii*.

The teleutospores of the foregoing species are mostly subglobose to spherical and (in the case of *H. vastatrix*) [ibid., iii, p. 647] napiform, but *H. woodii*, *H. canthii*, and *H. gardeniae-thunbergiae* also produce other shapes, such as falcate and triangular tridentate, which have never been observed in the coffee leaf rust. In all species they germinated readily *in situ*, producing basidiospores. The view that these organs are functionless cannot be unreservedly accepted. At present the genus *Hemileia* comprises only hemi-forms because of ignorance of the life-cycle, but basidiospore inoculations indicated that none of the species under observation is autoecious. There is some evidence that *H. vastatrix* oversummers in the uredo stage and does not depend on the teleutospores for the accomplishment of its life-cycle. It is concluded that the various species of *Hemileia* are distinct from one another and those on other genera are incapable of passing on to coffee.

Knaff (E. E. A.). **Étude du shedding dans les cultures cotonnières du Bas-Uélé pendant la campagne 1945.** [A study of shedding in the Cotton plantations of the Bas-Uélé area during the 1945 season.]—*Bull. agric. Congo belge*, xxxvii, 4, pp. 813–816, 1946.

A study of cotton 'shedding' [*R.A.M.*, xv, p. 147] in the Belgian Congo, carried out in 231 fields in different parts of the Buta and Aketi areas, with particular reference to the effect upon the condition of cultural practices and attacks by insects and fungi, showed that shedding is primarily of physiological origin, though phytopathological factors may preponderate. Date of sowing affects the condition in the sense that as the plants age shedding increases more rapidly than boll formation, so that production depends on the first-formed bolls [cf. ibid., xv, p. 719]. Soil factors vary in importance; as a rule, fallows of more than eight years are indicated. In clay soils thickly planted crops are least affected, while in sandy soils the reverse holds. In conclusion, it is pointed out that these observations only apply, for the present, to 1945, and it is hoped to carry out further research along the same lines.

Knight (R. L.). **Breeding Cotton resistant to blackarm disease (Bact. malvacearum). Part II. Breeding methods.**—*Emp. J. exp. Agric.*, xiv, 56, pp. 161–174, 1 pl., 1946.

In this concluding article [*R.A.M.*, xxv, p. 499] the author describes how new cotton varieties resistant to *Bacterium* [*Xanthomonas*] *malvacearum* may be bred, tested, and graded for resistance. For the tests it is suggested that sterilized seed should be used and the plants sprayed with the bacterial inoculum to ensure standardized infection. The preparation of the inoculum and the spraying method are described. In breeding, for those varieties already carrying B_2 [loc. cit.] it is necessary to select those lines homozygous for this factor; for those not carrying B_2 it must be transferred from resistant varieties by a series (four to six) of back-crosses. Other breeding methods described are those by which B_1 and B_3 can be incorporated in strains already carrying B_2, or added, with B_2, to fully susceptible strains.

Cury (R.). **Moléstias das Abelhas.** [Bee diseases.]—*Biológico*, xii, 10, pp. 241–254, 7 figs., 1946.

Brief notes are given on the etiology, symptoms, diagnosis, and treatment of the bee diseases caused by *Aspergillus flavus*, *Mucor hiemalis*, and *Pericystis apis* [*R.A.M.*, xv, p. 217] in São Paulo, Brazil. Both *A. flavus* and *M. hiemalis* invade stomach, intestines, and body cavity of the insect, causing progressive restlessness and debility, and paralysis.

Bhatt (R. S.). **Studies in the Ustilaginales. I. The mode of infection of the Bajra plant (Pennisetum typhoides Stapf) by the smut Tolyposporium penicillariae Bref.**—*J. Indian bot. Soc.*, xxv, 4, pp. 163–186, 1 pl., 19 figs., 1946.

A comprehensive, tabulated account is given of the author's experiments at Lucknow University on the mode of infection of *Pennisetum typhoides* by *Tolyposporium penicillariae* [*R.A.M.*, xx, p. 179].

Infection occurs only through the flower, which is most susceptible at an early stage of development before the stigma or anthers are externally perceptible. As growth proceeds infection becomes progressively less, and after pollination the flowers are virtually free from attack. In tests from 10th to 23rd September, 1942, the percentages of diseased ears from flowers inoculated when (*a*) enclosed within the glumes, (*b*) with peeping to semi-developed stigmas, (*c*) with mature stigmas, and (*d*) shrivelled stigmas and versatile anthers were 68·2, 52·7, 54·2, and 2·2,

respectively, the corresponding figures for the periods from 24th September to 10th October and from 15th to 31st October being 62·3, 57·1, 32, and 0 and 23·8, 11·1, 6·6, and 0, respectively. Dusting the stigmas with spore balls proved superior to the *in vacuo* method of inoculation [ibid., xv, p. 567 *et passim*] for the end in view. In a given variety the percentage and degree of infection were found to stand in direct relation to the humidity of the immediate environment, susceptibility to the smut being much greater in two localities visited under the humid conditions prevailing in the second week of September than during the dry weather in early November.

The invading mycelium of *T. penicillariae* pursues two courses. Most of the hyphae proceed from the stigma towards the receptacle, while others, after repeated branching, attack the ovary from the sides. Entry into the ovule and starchy endosperm is effected through the nucellus and micropyle and the tissues are gradually absorbed. In due course gelatinization of the hyphal walls proceeds from the receptacle and side walls of the ovary into the ovule and starchy endosperm in preparation for spore ball formation. The time elapsing between infection and spore formation was approximately a fortnight.

The seeds are entirely free from dormant mycelium and were experimentally shown to play no part in the initiation of infection, but the spores were found to hibernate in the soil without appreciable loss of viability; they germinate during the next rainy season in readiness for the next crop. The intensity of the disease increased annually with the successive cultivation of *P. typhoides*. Thus, in 1940, in a plot where the crop was grown after five to seven years' fallow, the smutted ears numbered 9 out of 762, while the corresponding figures for 1941 were 48 out of 344 and for 1942, 104 out of 442. It is suggested that if later-flowering varieties are cultivated they will flower in a drier period and escape infection.

LISSITZINA (Mme M. I.). Клеверный рак. [Clover rot.]—St. Publ. Off. Lit. collect. co-op. Fmg 'Selkhozgiz', Moscow, 32 pp., 6 figs., 1944. [English summary. Received January, 1947.]

Serious damage to the clover crop is caused by *Sclerotinia trifoliorum* in regions of high humidity in the U.S.S.R. [*R.A.M.*, vi, p. 98; vii, p. 449; xix, p. 23]. The symptoms appear during the first autumn after sowing, and may persist through the second year with an interval of quiescence in the heat of summer. The fungus is able to complete its entire life-cycle from mycelium to apothecia as a saprophyte. The minimum, optimum, and maximum temperatures for mycelial growth are $-2°$, $21°$, and $27°$ C., respectively, and the fungus is killed at $42°$ and $-24°$. The mycelium is active on and near the soil surface only until the onset of the hot weather. In the autumn following the dry summer of 1938, the sclerotia did not produce apothecia [cf. ibid., xx, p. 76; xxiii, p. 22].

In the writer's experiments, clover was infected by (*a*) mass inoculation with ascospores; (*b*) a small number of ascospores after germination on a standard nutrient medium, preferably carrot juice; (*c*) mycelium arising from ascospores developing saprophytically on the soil; (*d*) contact between diseased and healthy plants; and (*e*) mycelium radiating over the soil from infected plants. The spread of clover rot in the field is effected primarily by the mycelium. In the districts visited *S. trifoliorum* was found on a number of weeds, e.g., *Sonchus arvensis*, *Stellaria media*, *Myosotis intermedia*, *Galium mollugo*, and *Plantago media*, whence it may pass to clover. The following were experimentally infected by *Sclerotinia trifoliorum*: sunflower [ibid., ix, p. 655; xi, p. 652], parsley, carrot, lettuce, cucumber, vegetable marrow, and tomato, only the first-named, however, sustaining any injury. Conversely, *S. libertiana* [*S. sclerotiorum*] from vegetables induced in clover a disease similar to rot, while a species of *Botrytis* isolated from clover seeds caused a foliar decay in the same host.

S. trifoliorum is perpetuated on infested land by weeds and sclerotia produced in the soil, these being the chief sources of contamination in first-year clover. The elimination of weeds and the use of local clover strains are the most effective control measures.

KREITLOW (K. W.) & MYERS (W. M.). **Resistance to crown rust in Festuca elatior and F. elatior var. arundinacea.**—*Phytopathology*, xxxvii, 1, pp. 59–63, 1 fig., 1947.

Most of the 14-chromosome meadow fescue (*Festuca elatior*) plants observed for their reactions to crown rust (*Puccinia coronata*) [*R.A.M.*, xvii, p. 23] at the United States Regional Pasture Research Laboratory, State College, Pennsylvania, in 1942 and 1943 were susceptible, while the 42-chromosome tall fescue (*F. elatior* var. *arundinacea*) was usually resistant. One collection of *F. elatior* from Maine, however, was immune from the disease. Additional material from the same and neighbouring fields proved to be either *F. elatior*, in which most of the plants were susceptible to crown rust, or *F. elatior* var. *arundinacea* varying in its reactions from susceptible to immune.

LEBEN (C.) & KEITT (G. W.). **The effect of an antibiotic substance on Apple leaf infection by Venturia inaequalis.**—Abs. in *Phytopathology*, xxxvii, 1, p. 14, 1947.

A species of *Streptomyces* was found to be antagonistic on agar to 29 phytopathogenic fungi but not to most of the bacteria tested, including those commonly used in antibiotic assays and certain plant pathogens [cf. *R.A.M.*, xxvi, p. 164]. For the preparation of concentrates of the antibiotic substance, the antagonist was grown in shake-flasks containing a maize-steep glucose medium. The active material was obtained by ethanol extraction of the precipitate formed when the culture was acidified with hydrochloric acid to pH 2·5. Further fractionation yielded a solution completely inhibiting the growth of *Venturia inaequalis* at 1 in 8,000,000 and of *Sclerotinia fructicola* at 1 in 11,000,000 (solids basis, agar-streak test method). Eleven months' storage at 8° C. did not appear to impair the activity of ethanol solutions, from which the active material is precipitated on the addition of water. In three greenhouse tests, the development of scab on susceptible apple leaves was prevented or greatly reduced by a single spray application of an ethanol solution of the active principle four hours or four days before inoculation with *V. inaequalis*.

TAYLOR (G. G.). **Spraying experiments for the control of ripe-spot (Neofabraea malicorticis) in the Sturmer Apple variety.**—*N.Z. J. Sci. Tech.*, A, xxvii, 6, pp. 457–469, 1946.

Effective control of ripe spot (*Neofabraea malicorticis*) in Sturmer apples can be secured in New Zealand [*R.A.M.*, xxiii, p. 233] by spraying with Bordeaux mixture. However, considerations of fruit and leaf injury and the inhibition of fruit colour development by heavy residues limit the dosage rates and periods at which the mixture can be safely applied. The following factors were experimentally shown to be important in the determination of treatments for the end in view. The critical period for spraying against *N. malicorticis* appears to extend from mid-January to mid-February, during which time the fruit is relatively resistant to russeting but subject to copper injury. An increase in the proportion of hydrated lime to copper sulphate reduces spray injury without impairing the toxicity of the mixture to the ripe-spot pathogen. Thus, in one trial the amount of copper injury was reduced from 20 per cent. in the blocks sprayed three times with Bordeaux 2–2–100 to 8·7 and 4·3 per cent., respectively, for the 2–4 and 2–8–100 formulae, while in another the percentages of the defect resulting from two applications of

the mixture at 2–2, 2–4, and 2–6–100 were 40·7, 29·8, and 24·2, respectively. A reduction in the ratio of copper sulphate to hydrated lime lessens spray injury, but permits an increase in ripe spot. For instance, with two applications at 1–6–100 the percentages of infected fruits and copper injury were 19·2 and 0, respectively, while at 2–6 and 4–6–100 they were 9·1 and 1·5 and 5·6 and 13·4, respectively. An admixture of 4 pts. sulphite lye as a wetter with Bordeaux mixture reduces copper injury, but tends to decrease the efficacy of the treatment. The addition of cottonseed oil at 4 or 6 pts. to the 2–2–100 formula significantly reduced the amount of copper injury (from 18·2 per cent. with 8 oz. lime-casein to 5·9 and 3, respectively), without affecting ripe-spot control, but the spray residues were commercially objectionable at all dosages. The combination of lime-casein with Bordeaux mixture overcomes most of the difficulties connected with spray residues and poor coloration. None of the substitutes tested, viz., perenox, cuprox, oxi-cop, bar-cop, and Burgundy mixture, proved superior to Bordeaux for ripe-spot control, and all caused more damage to the fruit and foliage.

It is concluded that under existing standards for russet-grading a spray programme meeting commercial requirements would consist of a mid-January application of Bordeaux 2–6–100 and a mid-February treatment of 1–4–100, with an admixture of 8 oz. lime-casein on each occasion.

Berkeley (G. H.). **Cherry yellows and necrotic ring spot of sour Cherry in Ontario. No. 1. The value of Prunus persica and P. domestica var. Italian Prune as index hosts.**—Abs. in *Phytopathology*, xxxvii, 1, pp. 2–3, 1947.

Necrotic ring-spot symptoms on sour cherry [*R.A.M.*, xxv, p. 266], comprising delayed foliation, chlorotic spots, rings, and leaf necrosis, are of the 'shock' type, admitting of eventual recovery, while the leaf-yellowing and leaf-shedding due to yellows is chronic, recurring year after year. Budding experiments indicated that every source of cherry yellows tested also contained the necrotic ring-spot virus, but the latter has been found to occur with no admixture of the former. Peach seedlings, of the Elberta or Rochester varieties, were further shown to be of value as indicator hosts. Peaches reacted to the necrotic ring-spot virus by 'shock' symptoms of retarded foliation, die-back, and bark necrosis, followed by recovery, except in cases of extreme severity. In the same host the cherry-yellows virus induced 'shock' symptoms resembling the foregoing and a chronic rosetting of the shoots that persist. Italian Prune infected either by the necrotic ring-spot virus alone or with the cherry-yellows complex developed foliar necrosis of the 'shock' type, while the latter virus also caused chronic symptoms comparable to those of prune dwarf [loc. cit.]. Cherry yellows and prune dwarf, however, are believed to be caused by distinct viruses, probably composed of several strains inducing varying reactions.

Darpoux (H.). **Étude sur l'anthracnose du Cerisier.** [A study on Cherry anthracnose.]—*Ann. Épiphyt.*, N.S., xi, 3–4, pp. 161–175, 10 figs., 1945. [Received February, 1947.]

Cherry anthracnose, due apparently to *Coccomyces hiemalis* [*R.A.M.*, xxiv, pp. 128, 265, 376; xxv, p. 402], was found for the first time in France in 1942, at Versailles, by Arnaud, who observed only the summer conidial state of the fungus; the disease had, apparently, been present the year before. In 1943, Viennot-Bourgin observed affected trees in nurseries near Paris and Lisieux (Calvados), and infected leaves were received by the author from Chevry-Cossigy (Seine-et-Marne). In September, 1945, the disease was reported from Angers and Toulouse. The damage has not, so far, been severe, appearing only as leaf spots at the end of August or early in September and causing the susceptible varieties to lose their leaves a month early.

During the author's studies, he found a microconidial form with bacillary spores and a winter conidial form. The acervuli of the summer conidia usually form protuberances on the lower surface of the spots, developing from a stroma between the epidermis and the mesophyll. The conidia emerge from the stroma on short conidiophores, eventually rupturing the epidermis and forming a whitish mass. The hyaline, elongated, bent or flexuose conidia are usually non-septate when young and show one or, rarely, two, septa at maturity; they measure 45 to 65 by 2·5 to 4μ. The production of these *Cylindrosporium* conidia ceases with the end of the growth period of the host.

Towards the end of September, 1945, the author found on leaves beginning to turn yellow that the spots were blackened and the whitish spore mass had disappeared. The conidial stroma now bore 1-celled, hyaline microconidia measuring 4 to 5 by 1·5 to 2μ on hyaline, usually branched conidiophores seldom over 30μ long. This appears to be the stage referred to *Phoma* by Arthur in 1886. Microconidia in fungi of this group are not uncommonly observed. The author recently found bacillary spores on chestnut leaves infected by *Cylindrosporium castanicola* [ibid., xx, p. 558] and quince leaves by *Entomosporium maculatum* [*Fabraea maculata*: ibid., xvii, p. 188].

In 1943–4 winter conidia of the cherry fungus were seen. By the end of April, the old stroma of the acervulus had changed to a globular pycnidium-like organ consisting of a mass of round, hyaline cells surrounded by a wall of dark cells. In the middle, long, hyaline conidia were forming on short conidiophores. By the middle of June, these organs were 250 to 300μ in diameter and almost completely filled with spores, which were expelled through a pore. The spores were hyaline, flexuose, mostly 1-septate, and measured 50 to 85 by 2μ; they tapered at the distal and were truncated at the proximal end. The leaves had been left for the winter in a bag placed against a wall looking south in a relatively dry situation. This conidial stage allowed the fungus to overwinter, and, in the absence of ascospores, brought about the first infections the following summer.

Arnaud reported that the varieties early Anglaise Royale and Guignier were those least affected, and Viennot-Bourgin cited Anglaise Royale and Montmorency. At Versailles in 1943, 1944, and 1945 Montmorency was the most susceptible, followed, in order of decreasing infection, by Bigarreau Jaboulay, Bigarreau Napoléon, and Guigne; one unknown variety was completely resistant. In another orchard, it was observed in September, 1945, that the lower branches and those facing north and north-west were the first to be attacked, sometimes becoming completely defoliated, while the others were scarcely affected. Bigarreau de Montauban and Bigarreau Pelissier were most affected, closely followed by Montmorency à courte queue, while Guigne, Early Rivers, and Guigne noire de Montreux were not attacked.

In 1942, Arnaud secured effective control with one application of 1 per cent. Bordeaux mixture, on 8th May, some time after flowering, while in 1943 the author obtained complete protection with two at the same concentration, on 9th May and 16th June. Further work is in progress.

Foster (W. R.) & Lott (T. B.). **'Little Cherry,' a virus disease.**—*Sci. Agric.*, xxviii, 1, pp. 1–6, 1 fig. 1947.

Little cherry disease [*R.A.M.*, xxii, p. 10] in British Columbia appeared first in 1933 in an orchard on the West Arm of Kootenay Lake, and has since spread with great rapidity to distances of 15 to 45 miles, with 100 per cent. infection in some districts.

Diseased trees appear to grow normally, symptoms developing only in the fruits. These become angular and tapering, and are reduced to half their normal size, the differences becoming apparent about two weeks before maturity. They remain

bright red, with deteriorated sweetness and flavour. Diseased trees bear numerous fruits which are conspicuous and not hidden by leaves. Such fruits can be used only for processing, not for the fresh-fruit trade.

That the disease is due to a virus was shown by budding experiments. In an isolated orchard, buds from affected trees set on 24 healthy Lambert and Republican trees gave a total infection of 16 definite cases in the following year and 22 in the second year, while the virus had spread naturally to 32 of the remaining 36 trees. Although the rapidity with which the virus spreads suggests several insect vectors, none has yet been found.

Of the two local wild cherries which might function as carriers, *Prunus emarginata* was shown by budding experiments to be virus-free and *P. demissa* awaits examination. No variety of sweet cherry is known to be immune or symptomless, Lambert and Republican being particularly susceptible. Sour cherries show similar symptoms, but peach trees are not infected naturally.

This disease can be distinguished from the sweet cherry buckskin disease [peach X-disease virus: ibid., xxv, p. 37], which it somewhat resembles, by the absence in little cherry of the buckskin appearance of the fruit skin near the stalk, no orange or maroon coloration of the leaves, and no general stunting.

McClintock (J. A.). **Spraying for Strawberry fruit rots in 1946.**—*Hoosier Hort.*, xxviii, 10, pp. 147–148, 1946.

The reduction in the Indiana strawberry crop of 1946 from the combined effects of protracted frosts at flowering time and fungal rotting (mostly *Botrytis* [*cinerea*]) of the berries during a continuous rainy spell in the harvesting season was estimated at a minimum of 60 per cent. Infection was particularly severe on soft-fruited varieties, such as Premier, Dunlop, Majestic, and Tennessee Beauty, while Dorsett, Blakemore, and Robinson were comparatively resistant. The results of spraying experiments with wettable sulphur on 15 varieties were not encouraging, the treatment not only failing to control the rot but also causing severe leaf scorch.

Chaves Batista (A.). **'Tipburn' do Abacateiro, em Pernambuco.** [Avocado tipburn in Pernambuco.]—*Bol. Agric., Pernambuco*, xiii, 3, pp. 136–139, 2 figs., 1946.

Tipburn of avocado having been observed in Pernambuco, Brazil, the available information on the symptoms, etiology, and control of the disease in the United States [*R.A.M.*, xx, p. 484] is summarized. Soil drainage, one of the most important control measures, has given excellent results at the Pernambuco State Fruit Growing Station.

Das Gupta (S. N.) & Bhatt (R. S.). **Studies in the diseases of Mangifera indica Linn. VII. Latent infection in the Mango fruit.**—*J. Indian bot. Soc.*, xxv, 4, pp. 187–203, 8 figs., 1946.

In further studies on mango diseases in the Lucknow district [*R.A.M.*, xxv, p. 127], 13 fungi were found to occur in varying frequencies in the atmosphere of an orchard containing mostly the Khajli and Phajli varieties, viz., *Aspergillus nidulans*, *A. niger*, *A.* sp., *Acrothecium penniseti* [ibid., i, p. 103], *A.* sp., *Alternaria* spp. 1 and 2, *Spondylocladium* sp., *Fusarium* spp. 1, 2, and 3, *Penicillium* sp., and *Rhizopus arrhizus*. Of these, *Aspergillus nidulans*, *A. niger*, and *F.* spp. 1 and 2 were present throughout the mango season, while the others made only occasional appearances. The incidence of *A. nidulans* reached a maximum between the end of April and the third week in June, *A. niger* and *F.* sp. 1 began with a high concentration which gradually fell and then rose, *Alternaria* sp. 1 and *Acrothecium*

penniseti were fairly common, and next in frequency came *Alternaria* sp. 2 and *Acrothecium* sp.

Five different fungi were isolated from the tissues of apparently healthy developing fruits (158 Khajli and 112 Phajli), namely, *Aspergillus nidulans* from 28 of the former and 16 of the latter variety, *A. niger* (9 and 9), *Acrothecium* sp. (4 and 5), *Alternaria* sp. 1 (5 and 3), and *F.* sp. 1 (37 and 30). Latent infections with *Aspergillus nidulans* were induced either by spraying the fruits with a concentrated conidial suspension or by the application of conidia to superficial wounds. The fruits were most susceptible when under 75 mm. long, their resistance increasing with advancing maturity. Conidia remained in large numbers on the fruit surface, to which some of them adhered firmly, as well as in the substomatal cavities. A more usual means of perpetuation of the fungus, however, is through hyphae of limited growth which remain dormant in the subcuticular region for about two months, their activity being resumed shortly before the picking of the fruits and reaching a climax during storage. The epidermis and outer mesocarp offer more resistance to the passage of *A. nidulans* than the underlying tissues, through which its lateral spread is more readily effected. Hence the extent of subsequent decay depends on the depth attained by the pathogen before the fruits are picked for ripening.

McCallan (S. E. A.). **The identity of Alternaria and Macrosporium cultures used for slide-germination tests of fungicides.**—*Contr. Boyce Thompson Inst.*, xiv, 5, pp. 323–324, 1946.

Cultures of a fungus frequently used in experiments by the author and others have been referred constantly to *Alternaria solani*, although some doubt has been cast upon the correctness of this reference [*R.A.M.*, xx, p. 543] because of the small size and abundance of the spores of the organism and its non-pathogenicity to tomatoes. A critical examination in the light of recent work on the genus [*Canad. J. Res.*, Sect. C., xxii, pp. 217–234, 1944; *R.A.M.*, xxv, p. 579] has shown that the species is really *A. oleracea* [ibid., ii, p. 301], a view which has been confirmed by J. A. Stevenson of the United States Department of Agriculture, and J. W. Groves of the Department of Agriculture, Ottawa, Canada. In reports of various slide-germination tests where this fungus has been used [ibid., xv, p. 733; xvii, p. 540; xx, p. 543; xxii, pp. 145, 146; xxiii, p. 35; xxv, p. 401] it is named incorrectly *A. solani* instead of *A. oleracea*. The author points out that in greenhouse tests on tomatoes [ibid., xxiii, pp. 34, 139] and a sporulation study [ibid., xxiv, p. 115] *A. solani* proper was used.

Stemphylium sarcinaeforme [*sarciniforme*] is formally adopted in place of the synonym *Macrosporium sarcinaeforme* previously used by the author.

Delasnerie (J.). **Pulvérisation et pulvérisateurs.** [Spraying and sprayers.]—*Rev. Vitic., Paris*, xcii, 12, pp. 362–365, 5 figs., 1946.

This is a technical discussion of the means by which spraying machines could be made to deliver a very fine and homogeneous spray, and by which their operation can be facilitated. The author concludes from practical researches that jets must be well made and of hard, non-corroding metal. With jets of the Gobet type a greater volume of fine spray is secured and large drops eliminated if the orifice is a cylinder the length of which is definitely greater than the diameter.

Moore (M. B.) & Kommedahl (T.). **A technique for making serial dilutions.**—Abs. in *Phytopathology*, xxxvii, 1, p. 16, 1947.

A hypodermic syringe fitted with a 6-in. delivery tube is used for the accurate and aseptic dispensing of a known volume of a medium, say, 10 c.c., to each culture

tube in a dilution series, to the first of which 10 c.c. of a stock solution, e.g., of a fungicide, is then added. Thorough mixing is effected by repeated manipulation of the plunger of the syringe, while the delivery tube is inserted in the culture tube. A 10 c.c. portion of the first dilution is then drawn up, delivered into the second tube, and mixed, and so on throughout the series, in which each tube is one-half the concentration of the preceding one. Other ratios, such as 1:3:9, 1:4:16, and 1:10:100, may be used. In 890 tubes of serial dilutions only five contaminations occurred.

ARNSTEIN (H. R. V.), COOK (A. H.), & LACEY (M[ARGARET] S.). **Production of antibiotics by fungi. Part II: Production by Fusarium javanicum and other Fusaria.**—*Brit. J. exp. Path.*, xxvii, 6, pp. 349–355, 1946.

Of 19 species and strains of *Fusarium* investigated, 12 developed anti-bacterial culture solutions under selected conditions, viz., one strain of *F. culmorum* (against *Mycobacterium phlei*), *F. fructigenum* (*M. phlei*), two strains of *F.* (?) *lateritium* and one of *F. avenaceum* (*Staphylococcus aureus* and *M. phlei*), *F. sambucinum* (*M. phlei*, with a weaker action on other bacteria), and several unidentified strains, including one (F 6) similar to *F. fructigenum* (*M. phlei*) and another (F 64) antagonistic to *S. aureus* and *M. phlei*.

The production of two anti-bacterial pigments, javanicin and oxyjavanicin (naphthoquinones), by selected strains of *F. javanicum* [*R.A.M.*, xxv, p. 271] under a variety of conditions was examined. In addition to its inhibitory effects on a number of bacteria, including *M. phlei*, *S. aureus*, *B[acillus] subtilis*, and the plant pathogen, *Bact[erium: Corynebacterium] fascians*, javanicin displayed a feeble but specialized antagonism towards *Penicillium notatum*, *F. sambucinum*, *F. lateritium*, and *F. javanicum* in malt-bacto-tryptone or eupepton agar plate cultures.

NEUBERG (C.). **The biochemistry of yeast.**—*Annu. Rev. Biochem.*, xv, pp. 435–474, 1946.

The industrial applications of *Torulopsis utilis* [*R.A.M.*, xxvi, p. 116] and other yeasts are among the references to work of mycological interest in this survey of recent studies on yeast metabolism, which is supplemented by a bibliography of 278 titles.

ESBO (H.). **En del vanliga Potatissorters reaktion mot vissa vira.** [The reaction of a number of common Potato varieties to certain viruses.]—*K. LandtbrAkad. Handl., Stockh.*, lxxxiv, 4, pp. 299–313, 1945. [German summary.]

Investigations were carried out in Sweden from 1941 to 1944 to determine (*a*) the effects of virus Y, alone and in conjunction with virus X, on 12 widely grown potato varieties, and (*b*) the relation between the foliar symptoms and tuber yields [cf. *R.A.M.*, xxv, p. 77; xxvi, p. 25]. In the first experiment cylinders of tissue were bored out of sound tubers and replaced by similar material from diseased plants, the combined virus inoculum being furnished by Up-to-Date and that of virus Y by Sharpe's Express. The infected tubers were planted out in the spring. In the second test healthy tubers were grown surrounded by diseased ones, and the harvested tubers were replanted in the following year for observation.

The symptoms developing on the individual varieties were reasonably constant. The Swedish Gloria showed very marked crinkle and shortening of the petioles and leaves, but no necrosis or defoliation, while the other graft-inoculated varieties displayed virus Y symptoms of variable intensity which developed early and were most pronounced in Dunbar Yeoman and Up-to-Date. Early Puritan showed abnormal crinkle, mosaic spotting of the leaves at a very early stage, petiole and

leaf necrosis, compression and generalized stunting, brittleness, defoliation, and early withering. Eight other varieties [details of which are given] vary in the development of necrosis, compression, brittleness, stunting, and defoliation. Somewhat different results were obtained in the trial involving uniform exposure to spontaneous infection. For instance, the progeny of Early Puritan developed no necrosis and only slight mosaic, so that infection by virus Y had evidently not been transmitted, possibly because the diseased plants perished too soon for the aphid vectors (primarily *Myzodes* [*Myzus*] *persicae*) to acquire the infective material for dissemination. A similar lack of infection characterized the offspring of Irish Cobbler. Details are also given of the symptoms in the other varieties tested.

In general, the average reduction in tuber weight was correlated with the severity of the foliar symptoms. The yields from the progeny of inoculated Early Puritan, Irish Cobbler, and King Edward VII showed no uniform reduction as compared with those of the year of infection, but there were heavy falls in tuber weight in the case of Up-to-Date, Dunbar Yeoman, Bintje, and Erdgold.

FOLSOM (D.). **Potato yellowtop and unmottled curly-dwarf in Maine.**—*Bull. Me agric. Exp. Sta.* 446, pp. 87–95, 15 pl., 1946.

After a brief review and comparison of the virus diseases of Maine potatoes the author describes the symptoms of yellow top [potato apical leaf roll virus: *R.A.M.*, viii, p. 395; xxi, p. 499] as characterized by dwarfing and premature death of the plants, spindling, net necrosis, aerial tubers, an occasional necklace arrangement of the tubers on the stolons, and by stiff leaf texture associated sometimes with extreme necrosis and sometimes with leaf rolling and yellowing.

Potato unmottled curly dwarf [? a strain of potato spindle tuber: ibid., x, p. 50], a disease serious in Nebraska but detected in Maine only once outside the experimental plots, is distinguished from mottled curly dwarf (caused by potato leaf-rolling mosaic plus spindle tuber viruses) by the absence of mottling, and from spindle tuber by the greater leaf distortion, dwarfing, leaf burning, stem streaking, tuber gnarling and cracking, and occasional pith necrosis of the tubers. This last symptom is identical with that caused by yellow-dwarf virus [ibid., xv, p. 42]. Concerning the precise identity of the causal agents of these virus diseases and their relation with other somewhat loosely defined potato viruses, the evidence is confused. The author concludes that the Maine yellow top disease may be identical with one or more of a group including the aster yellows, purple top [a strain of aster yellows virus], witches' broom, and apical leaf roll viruses. Certainly in a year when an epidemic of aster yellows occurred owing to abundance of aster leaf hoppers [*Macrosteles divisus*] there was an increase in both yellow top and purple top in potatoes. Potato unmottled curly dwarf was thought to be transmitted from weeds by agalliar leafhoppers [*Agalliopsis* spp.], which transmit diseases of the yellow dwarf type [ibid., xxiii, p. 490].

BRANAS (J.). **Essais de produits anti-mildiou à l'École nationale d'Agriculture de Montpellier.** [Experiments with anti-mildew products at the National School of Agriculture of Montpellier.]—*Progr. agric. vitic.*, cxxii, 5–6, p. 27; 7–8, p. 43, 1945. [Abs. in *Ann. Épiphyt.*, N.S., xii, 1, p. 67, 1946.]

Field trials carried out in 1944, a year of slight infection, with various materials against vine mildew [*Plasmopara viticola*: *R.A.M.*, xxv, pp. 382, 537] again demonstrated that for an equal copper content copper oxychloride was less active than Bordeaux mixture, as also was copper-Sandoz. Bayer 23–17 W was equivalent in effect to Bordeaux mixture 0·1 per cent., its action being solely due to its copper content, i.e., 2·5 per cent. copper oxychloride. The author concludes that, Burgundy mixture apart, a given quantity of copper applied in the form of Bordeaux mixture is more active against *P. viticola* than if used in any other form.

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YARWOOD (C. E.). **Increased yield and disease resistance of giant hill Potatoes.**—*Amer. Potato J.*, xxiii, 10, pp. 352–369, 1 fig., 1 graph, 1946.

Netted Gem potato crops in the San Juan district of San Benito County, California, have exhibited in the last few years a widespread decline disease characterized by the premature death (within 70 to 100 days from planting) of the aerial parts of the plants. The cause of the trouble has not yet been determined, but the condition is associated with heavy infection by *Verticillium albo-atrum* and *Corticium vagum* [*C. solani*]. In every case, however, a few large stools were present which survived the rest and lived up to 134 days from sowing; these plants were resistant to *V. albo-atrum*, and, on an average, yielded 63 per cent. greater gross weight of tubers than the plants dying earlier. The giant plants have longer, heavier, and more branched aerial parts, fewer stems per hill, and an increased number and length of stolons. Selections of such late-maturing plants closely resembled those which have been described as giant hills [*R.A.M.*, xiii, p. 722] (also called bolters or males in Europe) and commonly considered to be due to a virus disease. All the progenies of such selections reproduced the early maturing character of the original plants, but to a varying degree, and the various strains developed from them also appeared to differ greatly with respect to most if not all the characteristics observed. Tests conducted from 1942 to 1945 showed them to be less susceptible to *Phytophthora infestans*, *Alternaria solani*, and *C. solani* and to be frost-resistant.

BARIBEAU (B.). **Seed Potato districts and virus diseases in Quebec.**—*Sci. Agric.*, xxvi, 12, pp. 654–661, 1 map, 1946.

In the Province of Quebec seed potatoes are grown in five main districts. Trials were made on 40 farms in these districts to determine the areas best suited to growing Foundation and Foundation A grades of potatoes. In the tests virus-free tubers of the Green Mountain and Irish Cobbler varieties were grown according to the tuber-unit method [*R.A.M.*, xxiv, p. 466]. The crops, amounting to some 125 to 300 bush. annually, were indexed in the autumn, and tested for virus diseases during the winter, by the tuber-index method [ibid., xv, p. 43].

As a result it was found that, while the incidence of leaf roll and mosaic varied with the season, locality, and isolation, both diseases showed an increase in occurrence and transmission the farther the growing areas were located towards the south and south-west of the Province. In general, the cool hill regions with well-spaced potato fields produce better seed than the warmer, lower districts, where the fields are close together. The author recommends the growing of seed potatoes in the north and north-east, while in the south and south-west it should be abandoned in favour of table stock. Bacterial ring rot [*Corynebacterium sepedonicum*] was never found in tuber-unit seed plots, and it is suggested that this method may provide a means of controlling the disease.

Cook (H. T.). **A method of forecasting late-blight epiphytotics in eastern Virginia.**—Abs. in *Phytopathology*, xxxvii, 1, p. 5, 1947.

The routine use of fungicides against potato and tomato late blight [*Phytophthora infestans*] has not hitherto been justified in eastern Virginia, where severe outbreaks of the disease occurred only twice in the 17 years from 1930 to 1946 on the former crop and once on the latter. Fungicidal treatments would, however, be valuable in years of heavy infection, and an analysis of the meteorological data for the period under review showed the feasibility of predicting such seasons by plotting the mean weekly temperature and cumulative rainfall for May and June on cross-section paper; by this means the advisability of spraying may be determined at weekly intervals during the growing season. The necessary combination for the development of widespread infection, i.e., rainfall above normal and temperatures below 75° F. from mid-May to at least mid-June, occurred only in 1938 and 1946. Tomatoes suffered from late blight only in the latter year [*R.A.M.*, xxvi, p. 136], when the low temperatures persisted throughout June.

Chester (K. S.). **Victory on the Potato front.**—*Sci. Mon., N.Y.*, lxiii, 1, pp. 73–76, 1946.

Some interesting facts are presented in this popular survey of the ravages of potato blight [*Phytophthora infestans*] and of the various control measures. In 1916 the United Kingdom potato crop was one of the poorest on record, but a well-organized spraying campaign in Ireland salvaged 1,000,000 tons that would otherwise have been destroyed. Again in 1943, one of the worst blight years in England, spraying increased yields by 25 per cent. In the United States in 1942, the fungus destroyed 25,000,000 bushels of the crop and extended its range far to the west and south, where no damage had previously been recorded [*R.A.M.*, xxii, p. 370; xxiv, p. 384]. In 1943 there was another general epidemic; in 1944 the north suffered less, but in parts of the south the disease assumed the most virulent form ever known; while in 1945 another violent outbreak reached even as far as the hitherto unscathed Great Plains. Thanks to research, however, scientists were to some extent prepared and in 1943 Dr. I. E. Melhus's forecasting service [ibid., xxiv, p. 468] was developed, thereby helping to save many millions of bushels in the threatened areas.

The shortage of copper precluded the free use of Bordeaux mixture for spraying, but the use of dithane gave excellent results in such widely separated States as Maine, Colorado, New Jersey, Wisconsin, Texas [ibid., xxiv, p. 69], and Florida [ibid., xxv, p. 43], where it is estimated to have increased the yield by 60 to 100 bush. per acre over the Bordeaux-sprayed, representing an extra $1,500,000 for the growers.

The critical shortage of spray machinery was met by the organization of 'spray rings' [ibid., xxiii, p. 276]. In Pennsylvania 100 spray rings, covering 16,000 acres on 2,300 farms, treated over one-tenth of the acreage of the State. This example was soon followed by New York, where the number of spray rings in 1944 was double that of 1943, and the system is rapidly being introduced into other States. One of the most damaging features of blight is the storage rot developing in externally sound tubers from diseased fields. During the winter of 1943–4, a quarter of the Maine crop rotted in storage, mainly from this cause. Haulm-killing to prevent the migration of the pathogen with the rain-water from the foliage to the tubers was effected by sinox, dowspray 66, and other herbicides [ibid., xxv, p. 276; xxvi, p. 78]. These preparations are also useful for the elimination of the blighted shoots emerging in the early spring from the cull potatoes on dump piles and serving as a source of inoculum for the new crops [ibid., xxii, p. 400].

Perhaps the most promising line of control, however, is the development of resistant varieties, the cultivation of which would save Maine growers alone an annual outlay of $1,000,000. Sebago and Sequoia enjoy great popularity at present,

though there are indications that the former is losing its resistance [ibid., xxiii, p. 117], but the New York-bred, fully immune Empire [ibid., xxv, p. 276], Placid, Virgil, Chenargo, and Ashworth, adapted to different regions, should be available in very limited quantities for the autumn (1946) market.

CLARK (C. F.). **The Calrose Potato: a new variety possessing resistance to late blight.**—*Amer. Potato J.*, xxiii, 10, pp. 343–347, 1946.

The new potato variety Calrose, U.S.D.A. seedling 672–26, from a cross between Katahdin and Ackersegen, is stated to have proved to be well adapted to the environmental conditions in California. Besides producing an abundant set of long and smooth tubers of attractive appearance, it is sufficiently resistant to late blight (*Phytophthora infestans*) to protect it from slight outbreaks of this disease. Its relatively long period of growth should make it suitable in regions where it is desirable to prolong the length of the harvesting and marketing period. It is susceptible to *Fusarium oxysporum* [cf. *R.A.M.*, xxiv, p. 245].

KREUTZER (W. A.), LANE (G. H.), & PASCHAL (J. L.). **Comparative effectiveness of certain knife disinfectants and the use of the double-edged knife for the control of ring rot of Potatoes.**—*Amer. Potato J.*, xxiii, 8, pp. 291–299, 1946.

Comparative tests made in 1945 in the San Luis valley of Colorado with Red McClure seed potatoes presumably free from ring rot (*Corynebacterium sepedonicum*) confirmed that boiling water or a 0·2 per cent. mercuric chloride solution for the disinfection of the rotary knife gave complete control of the disease [*R.A.M.*, xxv, p. 181]. Adequate control was not obtained with 0·5, 1, or 2 per cent. solutions of roccal and 0·2, 0·1, and 0·05 per cent. solutions of 25 per cent. hyamine 1622. Ring rot was controlled by a 2 per cent. solution of cresol (phenol co-efficient 5) which, however, adversely affected the stand of the growing plants; 1 per cent. cresol failed to give complete control.

Tests made with a stationary double-edged knife, newly devised for potato-growers, gave results equivalent to those obtained with the rotary knife. The new knife consists of a 6- to 8-in. blade sharpened on both edges and clamped upright to the edge of a cutting table. The knife is automatically disinfected by means of a short section of lamp wick fitted over the tip of the knife and connected by a small rubber tube to a 5-gal. tank containing the disinfectant, the flow of which is regulated by a metal valve at the bottom of the tank. A small metal trough at the base of the knife collects the used solution.

The risk of ring-rot infection resulting from the contact of the cut tubers with the contaminated cutting table was considerably reduced when mercuric chloride was used on the knife but not boiling water.

BONDE (R.) & SNYDER (E. G.). **Comparison of different organic and copper fungicides and some combinations of fungicides with DDT for the control of Potato diseases and insects.**—*Amer. Potato J.*, xxiii, 12, pp. 415–425, 1946.

In a spraying test carried out in 1945 in Maine on Katahdin potatoes, in which a number of fungicides were compared with Bordeaux mixture in respect of the control of late blight [*Phytophthora infestans*], early blight [*Alternaria solani*], and flea-beetle [*Epitrix cucumeris*] injury [*R.A.M.*, xxvi, p. 166], Bordeaux mixture (8–6–100), cuprocide (2–100), copper compound A (4–100), tribasic copper sulphate (4–100), basic copper arsenate (4–100), isothan Q 15 (1 pint per 100 gals.), phygon (2–3 dichloronaphthoquinone 1–4; 1–100), puratized (phenyl mercuritriethanol ammonium lactate; 0·8–100), and the control (unsprayed except against Colorado beetle [*Leptinotarsa decemlineata*]), gave, respectively, 'protective co-efficients' (ratio of the infective index [*R.A.M.*, xxi, p. 354] of Bordeaux plots, i.e., 100, to the infective index of the treatment being compared) against late blight of 100, 89, 90, 99, 89, 43, 102, 90, and 10 per cent., respectively. Against early blight the

corresponding figures were 100, 72, 81, 88, 80, 35, 78, 97, and 24 per cent.; and against flea-beetle 100, 77, 74, 68, 103, 60, 60, 60, and 20 per cent. The yields per acre were, respectively, 355, 377, 363, 363, 360, 314, 300, 297, and 303 bush.

Other plots were sprayed with Bordeaux mixture, basic copper sulphate, basic copper arsenate, fermate (2–100), karbam Z (2–100), karbam Z and soap (2–1–100), and dithane (2 qts. to 1 lb. zinc sulphate plus ½ lb. lime), and also with each plus 2 lb. 50 per cent. DDT per 100 gals. The addition of the DDT increased the yields by from 16·3 to 32·1 per cent. and also the protective co-efficients against early blight of Bordeaux mixture, basic copper sulphate, fermate, karbam Z (with soap), and dithane. The improvement is attributed to the greatly reduced number of flea-beetle punctures, which afford entry to *A. solani*, and also to the delayed plant maturity caused by DDT applications, this delay being associated with the reduction in early blight. DDT also increased the control of late blight by Bordeaux mixture, basic copper sulphate, basic copper arsenate, karbam Z (with soap), and dithane.

Much of the yield increase derived from the use of DDT in the spray fungicides resulted from a reduction in the injury caused by flea-beetles and aphids. DDT alone increased yields by 38 bush. per acre or 12·5 per cent. over the unsprayed controls. When applied at the rate of 1 lb. per 100 gals. spray mixture it reduced the aphid population by approximately 80 per cent., which greatly increased yields.

In view of these results and those of other workers it seems that Bordeaux mixture may be replaced by the neutral coppers or certain organic fungicides in combination with DDT or other insecticides.

BERKELEY (G. H.), THOMPSON (R.W.), & RICHARDSON (J. K.). **Potato spray tests in Ontario.**—*Amer. Potato J.*, xxiii, 8, pp. 285–290, 1 fig., 1946.

Very brief details are given of plot tests made in 1945 in Ontario in an attempt to re-assess the relative value of well-known spray and dust materials alone and combined with DDT in the control of potato diseases and insect pests [see preceding abstract]. The results, judged by the yield of tubers, indicated that DDT (4 oz. in 40 gals. water) effectively controlled insect pests, and that leafhoppers were more responsible for decreased yields than early blight (*Alternaria solani*) or late blight (*Phytophthora infestans*). Bordeaux mixture (4–4–40) and dithane zinc sulphate plus lime (2 qts.–1¼–⅝–100) gave good control of both early and late blights and yields of 311 and 333 bush. per acre; 6½ per cent. copper oxychloride sulphate (C.O.C.S.) dust, 5 per cent. copper A, and spraycop (3½–40) came next in order of effectiveness (277, 240, and 269, respectively), while fermate (1–40) and puratized (8 oz.–100) were less effective. The addition of zinc sulphate plus lime to C.O.C.S., copper A, and fermate sprays improved blight control appreciably and increased the yields. With DDT added to the various fungicides the yields ranged from 287 to 618 bush. per acre.

DENNY (F. E.). **Non-transference of virus disease in treatments of Potato tubers to break dormancy.**—*Contr. Boyce Thompson Inst.*, xiv, 5, pp. 305–313, 1946.

During the treatment process for inducing early germination in potato tubers [*R.A.M.*, xxii, p. 492] cuttings of healthy tubers may come into contact with virus-infected pieces or juice. In order to investigate the possibility of the transference of potato mosaic and leaf-roll viruses by this means, 1,275 cuttings of disease-free Irish Cobbler, Katahdin, and Early Ohio potatoes of the 1943 crop were mixed, during the ethylene chlorohydrin process [loc. cit.], with cuttings of tubers infected with leaf roll or mosaic. Healthy Bliss Triumph and Green Mountain were mixed with mosaic-infected pieces only. None of the full-grown plants from the healthy cuttings developed any symptoms of the diseases. Irish Cobbler tubers from the 1944 crop infected with spindle tuber virus were used to provide contamination for 700 healthy cuttings in a similar experiment. None of the plants developing

from the latter showed any spindle tuber symptoms during growth, nor did measurements of their tubers and those of their progeny disclose any increase in the length: breadth ratio over that of the controls.

PLOTHO (O. v.). **Untersuchungen an Proactinomyceten.** [Studies on Proactinomycetes.]—*Naturwissenschaften*, xxxiii, 4, pp. 124–125, 3 figs., 1946.

The author's intensive studies at Göttingen University, Germany, on Proactinomycetes from soil samples [*R.A.M.*, xii, p. 324] of widely divergent origin have demonstrated the capacity of these organisms for the decomposition of ring compounds, such as aniline, and heterocyclic compounds, e.g., pyridine, piperidine, and nicotine, a matter of great interest in connexion with the present-day prominence of research on humus problems.

Like their near relatives the Actinomycetes, the Proactinomycetes display a bewildering pleomorphism, and the use of monospore cultures is essential to specific identification. All the strains gave rise in the first place to non-septate, more or less branched mycelium, disintegrating through septation into rods and cocci. Aerial spores are never formed, but members of the *ruber* group with red or orange pigment produce minute hyphae. On the other hand, the representatives of the groups *flavus* and *citreus*, especially the latter, form densely compressed colonies of closely packed rods. Reproduction is effected by means of resting cells, budding, and permanent forms.

Gelatine is actively liquefied by the *citreus* group, slowly and feebly by *flavus*, and not at all by *ruber*, and a similar relationship was observed in connexion with starch hydrolysis. Raffinose was the best source of sugar.

WILLIS (L. G.). **Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition. First supplement to the third edition.**—82 pp., 1940; **Botanical index to the third edition.**—24 pp., 1940; **Fourth Supplement to the third edition.**—92 pp., 1943; Chilean Nitrate Educational Bureau, Inc., 120 Broadway, New York. [Received October, 1946.]

These publications present additional abstracts, taken mainly from *Chemical Abstracts* and the *Experiment Station Record*, on all aspects of minor element nutrition [cf. *R.A.M.*, xvi, p. 276], together with an index of all the plants (including fungi) referred to in the third edition [published in 1939].

Magnesium symposium.—*Soil Sci.*, lxiii, 1, pp. 1–78, 1947.

Three of the seven papers comprising this symposium are concerned primarily with the phytopathological aspects of magnesium deficiency, namely, magnesium in citrus fertilization in Florida, by A. F. CAMP (pp. 43–52) [*R.A.M.*, xx, p. 461], magnesium nutrition of apple trees, by D. BOYNTON (pp. 53–58) [ibid., xxv, p. 180], and effect of magnesium on growth and composition of tobacco, by J. E. MCMURTREY [ibid., xvi, p. 781].

BRIERLEY (W. B.). **Mineral deficiencies in plants and their diagnosis.**—Reprinted from *Agric. Progr.*, xx, 2, 10 pp., 1945.

The author briefly examines the special problems inherent in the diagnosis of the nutritional (mineral-deficiency) diseases of plants. He considers that the study of these diseases should not be left to the agricultural chemist or plant physiologist, but should be included in the normal training of every plant pathologist to enable him to see the whole subject in its logical perspective. It is stressed that in studying nutritional and other non-parasitic plant troubles, the observer is primarily, and often entirely, dependent on visual diagnosis by clinical symptoms, the correct interpretation of which offers, however, some specific difficulties, and requires visual accuracy and considerable experience on his part. The use of coloured plates illustrating crop plants suffering from various mineral deficiencies, such as those

in 'Hunger signs in crops' [*R.A.M.*, xxi, p. 42] and in 'Diagnosis of mineral deficiencies in plants: a colour atlas and guide', by Professor T. Wallace [ibid., xxiv, p. 337], may be very helpful in this connexion, provided they are used as pointers leading to a tentative hypothesis and not as a final authority.

DARPOUX (H.). **Puccinia carthami Cda, rouille du type Brachypuccinia.** [*Puccinia carthami* Cda, a rust of the *Brachypuccinia* type.]—*Ann. Épiphyt.*, N.S., xii, *Sér. Path. vég.*, *Mém.* 4, pp. 91–99, 6 figs., 1946.

On the 11th May, 1945, the author observed on the cotyledons of safflower at Versailles the spermagonia of a fungus, round which, a few days later, sori containing [what the author calls] primary uredospores appeared. Subsequently, true uredospores and teleutospores of *Puccinia carthami* [*R.A.M.*, xxv, pp. 319, 416] developed on these plants and others in proximity to them.

When safflower plants were grown aseptically in Erlenmeyer flasks and sterile water containing teleutospores of *P. carthami* was deposited on the cotyledons, spermagonia, and two or three days later uredospores, identical with those observed in nature, appeared after a week's incubation at 18° C. Inoculations with these uredospores gave rise to uredospores and teleutospores of *P. carthami*.

The subepidermal, later erumpent, spherical or piriform spermagonia averaged 85 to 100μ in diameter and contained hyaline, oval, or ellipsoidal spermatia, 1·5 by 2 to 3μ. The primary uredospores formed round some lesions were pulverulent, light chestnut-colour, spherical, echinulated when young, almost smooth when mature, 20 to 25μ in diameter, and were borne on a thick, hyaline pedicel arising from dikaryon cells.

Morphologically they resembled the secondary uredospores of *P. carthami*, but followed the spermagonia and took the place of aecidia; such organs have been named uredinoid aecidia by Arthur [ibid., xiii, p. 728]. Among the primary uredospores rare bicellular spores were seen. Further investigation is required before these can be regarded as aecidiospores, and meantime the author prefers to keep the term primary uredospores.

BERKELEY (G. H.). **Alfalfa mosaic on Pepper in Ontario.**—Abs. in *Phytopathology*, xxxvii, 1, p. 3, 1947.

Preliminary inoculation tests extending over a three-year period with the virus of an unusual type of mosaic observed on the California Wonder chilli variety in Ontario in 1943 and 1944 indicated a close relationship to *Marmor medicaginis* H. [lucerne mosaic virus], as also did cross-protection and thermal death-point experiments. The effects of the new virus and *M. medicaginis* vars. *typicum* and *solani* [strains of the lucerne mosaic virus] on tobacco, *Nicotiana rustica*, *N. glutinosa*, broad bean, sweet pea, pea, bean (*Phaseolus vulgaris*), red clover, chilli (*Capsicum frutescens*), soy-bean, eggplant, *Zinnia elegans*, cucumber, *Petunia hybrida*, tomato, *Antirrhinum majus*, and celery were similar except that the chilli virus did not infect tomato, while the other two did, and the chilli and typical lucerne mosaic viruses attacked cucumber, which reacted negatively to the *solani* strain. The last-named induced on *N. rustica* and *N. glutinosa* prominent calico symptoms with wide veinbanding, a feature that was absent on the same plants inoculated with the other two viruses. The chilli virus, on the other hand, caused much more severe necrosis on tobacco and the other *Nicotiana* spp. than did the other two strains of the lucerne mosaic virus.

MATHUR (R. S.). **Sugarcane red rot and its control.**—*Indian Sug.*, ix, 9, pp. 356–357, 1946.

Sugar-cane red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*] appeared in epidemic form in 1946 in several districts of the United Provinces

[*R.A.M.*, xxvi, p. 45], and the writer makes an urgent plea to growers for the immediate application of control measures, and gives a brief account of the symptomatology and mode of infection of the causal organism. By the date of writing it was assumed that the process of sporulation, which was exceptionally prolific in the highly pathogenic strain of the fungus occurring locally [ibid., xxvi, p. 144], had been completed, and the prompt harvesting of severely affected plots, particularly ratoon, was advocated. The green portions should be fed to cattle, the shrivelled canes burnt at once, and the fields prepared for rabi [chickpea: *Cicer arietinum*] cultivation. In fields where infection is limited to a few canes, roguing of the entire plant, including stubble and roots, may be practised. In such cases the green material may be used at the grower's discretion, but the desiccated canes must be burnt. After these operations the surviving crop of highly susceptible varieties, such as Co. 210, Co. 214, Co. 281, Co. 290, Co. 299, Co. 312, Co. 331, Co. 442, Co. 445, Co. 537, and Co. S5, must be crushed at the first opportunity, and the areas cleared and not replanted with sugar-cane for three years. Ratoons of susceptible varieties should be discarded. The following varieties have been tested for a number of years at research stations and may be recommended as fairly reliable for large-scale cultivation: Co. 109, Co. 146, Co. 186, Co. 245, Co. 313, Co. 356, Co. 385, Co. 393, Co. 421, Co. 453, and Co. 527. Separate, well-drained plots should be set aside for seed production. Here roguing and burning of diseased stools should be carried out at an early stage, and the setts, taken from perfectly healthy stools, should be examined for the presence of red spots on the cut ends before planting.

McMartin (A.). **Sugarcane mosaic disease and methods for its control. Report on the survey of the Government Inspectors.**—*S. Afr. Sug. J.*, xxx, 11, pp. 549, 551, 553, 555, 1 map, 1946.

The inspectors commissioned by the South African Government to ascertain the distribution of the sugar-cane mosaic virus in Natal and collect other important data relevant to the disease [*R.A.M.*, xxvi, p. 30] visited a total of 552 farms (424 on the north and 128 on the south coast), of which 82 (14·8 per cent.) were found to be harbouring the virus in the proportion of 39 (9·2) on the north and 43 (33·6) on the south coast. With very few exceptions, the disease was absent in the immediate vicinity of the sea and north of the Umvoti River. The area of infection was situated mainly in the Umzinto district, where the incidence ranged from 20 to 90 per cent., and from Avoca to Chaka's Kraal, while an outbreak was also observed at Umzimkulu. The intensity of the disease seemed to increase in the presence of natural bush, which has been left in some strips running inland. The particular strain of the virus occurring in Natal is a mild one, inducing inconspicuous symptoms and exerting no apparent ill effects on the health of the canes.

The position as regards the spread of mosaic from other crops to sugar-cane was as follows. Where maize was intercropped with cane and *Setaria sulcata* was present in the neighbourhood in a healthy state, no infection was found on the cane, but where the wild grass was attacked the virus passed to the plantation. Among the fodder grasses increasingly cultivated in Natal, *S. splendida* has been found susceptible to mosaic and should not be used; the reaction of antelope grass (*Echinochloa* sp.) is not known, but in Cuba *E. colonum* is both susceptible to the disease and a host of the vector, *Aphis maidis* [ibid., vi, p. 318].

The widely grown Co. 281 variety showed the highest incidence of infection, Co. 301 being less susceptible and also exhibiting a tendency to recovery; a few cases were further observed on Co. 331, but none on Co. 290 or N:Co. 310.

Among the recommendations for control suggested by Dr. Wager, of the Botanical Station, Durban, are the procurement of seed-cane from fields that have

been inspected and found free from mosaic; roguing of diseased plants in plant cane fields at frequent intervals, beginning when the shoots are 6 in. in height, similar measures being applicable to fields of ratoon cane with up to 10 per cent. mosaic, while those with a higher incidence should be ploughed up at the earliest possible date, and all the roots destroyed before replanting.

COOPER (V. E.) & CHILTON (S. J. P.). **Occurrence of Actinomyces antibiotic to Pythium in some Sugar-cane soils of Louisiana.**—Abs. in *Phytopathology*, xxxvii, 1, pp. 5–6, 1947.

A survey was made in 1946 of a soil-inhabiting *Actinomyces* antibiotic to the species of *Pythium* responsible for sugar-cane root rot in Louisiana, including *P. dissotocum* and *P. periilum* [*R.A.M.*, xix, p. 435]. Of 3,788 cultures tested against a parasitic strain of *Pythium*, 896 (23·6 per cent.) showed varying degrees of antibiosis, 365 inhibiting the advance of the pathogen in Petri dishes at 1 to 5 mm., 301 at 6 to 10, 140 at 11 to 15, 90 at 16 and upwards, and 10 at 35 or more. A progressive increase of the *Actinomyces* populations in the soil occurred from March to August, but the percentage of antibiotic strains decreased. The proportion of antibiotic strains and their average capacity for inhibitory action was lower in the heavy soils favouring the disease than in lighter ones.

SWINGLE (D. B.). **A textbook of systematic botany. Third edition.**—xv+343 pp., 1 col. pl., 57 figs., 47 diags., 2 maps, New York and London, McGraw-Hill Book Company, 1946. 17*s*. 6*d*.

This manual, devoted primarily to phanerogams, contains much that is of interest to the systematic mycologist, including notes on the use of keys in identification, a discussion of floral formulae, directions for the preparation of herbaria, and chapters on nomenclature, the principles of taxonomy, systems of taxonomy, and the literature of systematic botany, with frequent references to items applicable to the classification of fungi.

GUYOT (A. L.). **Contribution à l'étude des cryptogames parasites du sud-est de la France et de l'Afrique septentrionale.** [A contribution to the study of the parasitic fungi of south-eastern France and north Africa.]—*Ann. Éc. Agric. Grignon*, Sér. 3, v, pp. 20–29, 1945–1946.

This annotated list of fungi collected by the author in south-eastern France, Algeria [*R.A.M.*, xxvi, p. 130], and Tunisia (with some found by C. Chabrolin and J. Fortin) includes *Sorosporium saponariae* [ibid., xxv, p. 12] on wild *Dianthus caryophyllus* in the Alpes-Maritimes, *Septoria graminum* [*S. tritici*: ibid., xxv, p. 155] on *Briza maxima* in two localities in Var, *Entyloma calendulae* [ibid., xx, p. 119; xxiii, p. 475] on *Calendula arvensis* and *C. algeriensis*, *E. calendulae* f.sp. *chrysanthemi* n.f. on *Chrysanthemum coronarium*, a new host for *E. calendulae*, and *Tuburcinia* [*Urocystis*] *tritici* on wheat and *Triticum durum* at Tunis, and *Ustilago hordei* and *U. nuda* on cultivated barley, both found at Kaurouan, Tunisia.

DE SOUSA DA CÂMARA (E.) & BRANQUINHO DE OLIVEIRA (A. L.). **Contributio fungorum minima in Lusitania collectorum. I. Oomycales.** [A small contribution of fungi collected in Portugal. I. Oomycales.]—*Agron. lusit.*, vi, 3, pp. 301–314, 2 pl., 1 fig., 1944. [Received February, 1947.]

Included in this first instalment of 39 entries towards the authors' contribution to the mycoflora of Portugal [cf. *R.A.M.*, xxv, p. 47] are *Synchytrium endobioticum* on potato in Lisbon [ibid., xii, p. 672], *Peronospora* [or *Pseudoperonospora*] *cannabina* on hemp [ibid., xix, p. 435] near Santarem and Torres-Novas, *Peronospora coronillicola* n.sp. on *Coronilla glauca* at Sacavem, and *Phytophthora hibernalis*,

collected in 1943 on the leaves and fruits of orange, grapefruit, and citron [ibid., xxii, p. 354 *et passim*].

SEMADENI (F. O.) & GÄUMANN (E.). **Über den Formenkreis der Puccinia bistortae (Str.) DC.** [On the form-cycle of *Puccinia bistortae* (Str.) DC.]—*Ber. schweiz. bot. Ges.*, lv, pp. 146–150, 2 graphs, 1945.

In the canton of Grisons, Switzerland, *Puccinia cari-bistortae* Kleb. forms its teleutospores on *Polygonum bistorta* and *P. viviparum* and its aecidial stage on *Angelica sylvestris* and caraway (*Carum carvi*). In 1942, however, the range of the haplophase was extended by successful inoculation experiments with an Alpine collection of the rust on *Chaerophyllum hirsutum*, anise (*Pimpinella anisum*), and *P. peregrina*, not hitherto recorded as hosts. Aecidiospores of *Puccinia cari-bistortae* from *C. hirsutum* infected both *Polygonum bistorta* and *P. viviparum*. The plurivorous Alpine form of the rust is in complete morphological agreement with the type species, and the purely biological distinguishing character of the former may be expressed by the designation f.sp. *alpina*. At the same time the addition of f.sp. *angelicae-bistortae* Kleb. to the name of the type species is proposed.

JENKINS (A. E.), BITANCOURT (A. A.), & POLLACK (F. G.). **Spot anthracnoses in the United States.**—*J. Wash. Acad. Sci.*, xxxvi, 12, pp. 416–421, 2 figs., 1946.

Additional records of spot anthracnoses (*Sphaceloma* and *Elsinoe* spp.) in the Pacific Coast States [*R.A.M.*, xxv, p. 563; cf. ibid., xxvi, p. 31] have become available through the work from 1943 to 1945 of the special survey in the general vicinity of ports of entry of the U.S. Bureau of Entomology and Plant Quarantine [ibid., xxv, p. 292]. They include *S.* sp. on *Rhododendron macrophyllum*, *E.* sp. on *Gaultheria shallon*, in association with *Phyllosticta gaultheriae*, both in Washington, *S.* (?) *mattirolianum* on *Arbutus unedo* [ibid., xiii, p. 661] and *A. menziesii* in California (believed to be the first record of the pathogen in the United States), *S. ribis* n.sp. Jenk. & Bitanc. on gooseberry in Washington, *S. viburni* n.sp. Jenk. & Bitanc. on *Viburnum opulus* var. *roseum* and *V. suspensum* in Washington and California, *S. cercocarpi* n.sp. Bitanc. & Jenk. on *Cercocarpus betifolius* var. *multiflorus* in California, and *S. hederae* n.sp. Bitanc. & Jenk. on ivy in California, North Carolina, and São Paulo, Brazil.

S. ribis, the agent of gooseberry scab, produces on the foliage numerous convex spots, sometimes circular or subcircular on the veins, mostly up to 1 mm. in diameter, grey with an inconspicuous, yellow margin, dotted with black, erumpent acervuli, up to 63 by 40μ; the conidiophores are dark, continuous or triseptate, up to 15μ long, arising from a pallid stroma, and the conidia variable, hyaline or coloured, spherical, up to 3μ in diameter, or elliptical, 8 by 5μ.

The convex spots formed by *S. viburni* on the leaves of the above-mentioned *V.* spp. are circular to triangular or irregular, tending to follow the veins or margins, up to 2 mm. in diameter or more or less diffuse, with grey to white centres and brown edges, sometimes dotted with black, erumpent, compact, pulvinate, acervuli up to 61 to 100μ in diameter and 21 to 50μ in thickness. Conidia were not observed.

S. cercocarpi produces on *C. betulifolius* var. *multiflorus* leaves scattered or marginal, convex, circular or subcircular, sometimes coalescent spots, up to 3 mm. in diameter, with pale centres bearing papuliform, erumpent, compact, pallid, sometimes confluent acervuli, 57 to 60μ in diameter and 44 to 70μ in thickness, and sometimes slightly raised, purple margins. Conidia were not observed.

Ivy leaves attacked by *S. hederae* bear numerous scattered or densely aggregated, circular or subcircular, verruciform, concave, often confluent spots, 1 to 5 mm. in diameter, brown with a pale to dark centre; the straight or curved, mostly acute, commonly continuous, occasionally triseptate conidiophores arise from

intraepidermal hyphae in fascicles up to 53 to 200μ in diameter and measure up to 47 by 5·3μ, and the hyaline or coloured conidia may be either spherical, up to 6μ in diameter, or elliptical, 2·5 to 7·8 by 1·7 to 5·3μ.

MILLER (J. J.). **Cultural and taxonomic studies on certain Fusaria. I. Mutation in culture.**—*Canad. J. Res.*, Sect. C, xxiv, 5, pp. 188–212, 3 pl., 1946.

This work was undertaken with a view to determining whether the tendency of the 'wild-type' isolates of the *Fusarium* [*F. bulbigenum* var. *niveum*] of muskmelon wilt [*R.A.M.*, xxv, p. 249] to form mutants is shown by other species. Examination of the abnormal areas appearing in single-spore cultures of 13 isolates from different sources representing the section *Elegans*, and three *Liseola*, *Discolor*, and *Gibbosum*, respectively, showed the larger areas to be of mutant origin, as single-spore cultures from them were predominantly purely mutant in form. Chlamydospores were more abundant in the mutants. The 'sclerotia' observed in cultures of some of these organisms may putatively be considered of mutant origin also, sclerotial cultures being obtained from mutants of the pea isolate. A comparison of the morphological and cultural features of the patch mutants with those of sporodochia described in literature suggested that these terms are synonymous. As some patch mutants produce abundant macroconidia the value of the common practice of measuring macroconidia from sporodochia for taxonomic purposes is questioned [ibid., xxv, p. 366]. It was shown, too, that of cultures derived from rapidly germinating spores 64 per cent. were mutant, whereas slower ones gave only 34 per cent. of mutants on the average. The ready displacement in culture of the wild types of *Fusaria* by mutants indicated that some method of maintaining the original isolates in the pure state is indispensable to a consistent taxonomy of the genus. It is recommended that *Fusaria* should be kept in tubes of sterilized soil; this method of cultural treatment, having been shown experimentally not to yield mutants (except in the case of the flax and cotton strains which gave a low percentage), will assist the retention of the wild type.

The muskmelon *Fusarium* was shown by experiment to have retained its viability after three years in dry soil culture and to have undergone no change in cultural form and suffered no loss of virulence during that time. The other strains studied were still viable after 13 months or more under similar conditions.

Further experiments on cultural interaction [ibid., xxiv, p. 351] lend support to the suggestion that it can be used as a taxonomic criterion, and two saprophytic strains were separated by this means. After reviewing and rejecting various theories which have been put forward to explain cultural variation the author maintains that the weight of evidence favours the view it is due to mutation. The production of mutants in nature is considered to be relatively infrequent. The author stresses the importance of making comparisons as soon as possible after isolation unless great care is taken to preserve the purity of the originals. Where differences in cultural appearance or host specialization, or both, are noted among the original isolates, these should be regarded as separate wild types of the organism concerned.

MILLER (J. J.). **Cultural and taxonomic studies on certain Fusaria. II. The taxonomic problem in Fusarium with particular reference to section Elegans.**—*Canad. J. Res.*, Sect. C, xxiv, 5, pp. 213–223, 1946.

In this second study of certain '*Fusaria*' [see preceding abstract] the conclusion that the 'normal' culture of certain specialists [*R.A.M.*, iv, p. 706] represents the dominance of the original or wild type by a mutant, and that the sporodochia appearing in cultures of *Fusarium* are actually patch mutants, is shown to bear conspicuously on the taxonomy of the genus. Macroconidia, for example, of different mutants of one strain have been found to differ in length, width, and

curvature, and even those of one mutant may differ among themselves [cf. ibid., xxv, p. 366]. The implication is that the species descriptions of many '*Fusaria*' based largely on these 'normal' cultures are really of cultural variants; if confusion is to be avoided, they should be based only on the characters of the wild types. While the close similarity of the components of certain groups of '*Fusaria*' may make morphological separation of wild types within them extremely difficult, the wide range of variation exhibited by these organisms in artificial media should not deter workers from this task. Only where morphological separation is extremely difficult, or where variability in nature makes consistent diagnosis uncertain, should species be merged.

Working with 13 different wild-type isolates of the section *Elegans* the author was able to distinguish between them morphologically and gives a key for their determination. He considers that the 'wild-type' concept is similar to Padwick's suggestion that the taxonomy of the genus must be based on field work [ibid., xxi, p. 428]. Objections to the systems of Snyder and Hansen [ibid., xix, p. 495] and Wollenweber and Reinking [ibid., xiv, p. 708; xxiii, p. 410] are raised, but it is considered that the differences between them may be reconciled.

VIÉGAS (A. P.). **Alguns fungos do Brasil. XII. Fungi Imperfecti—Melancoliales.** [Some fungi of Brazil. XII. Fungi Imperfecti—Melancoliales.]—*Bragantia, S. Paulo*, vi, 1, pp. 1–37, 11 pl., 2 figs., 1946.

This further contribution to the author's studies on Brazilian fungi [cf. *R.A.M.*, xxvi, p. 129] includes *Colletotrichum andropogonis* on sorghum [ibid., xviii, p. 517], *C. coffeanum* [*Glomerella cingulata*] on coffee [ibid., xxvi, p. 105 and above, p. 198], *C. eucalypti* Bitanc. on *Eucalyptus* sp., *C. falcatum* [*Physalospora tucumanensis*] on P.O.J. 2714 sugar-cane leaves [ibid., ix, p. 808; xviii, p. 619], *C.* [*Glomerella*] *gossypii* and *C. gossypii* var. *cephalosporioides* on cotton [ibid., xviii, p. 798], *C. lagenarium* on the Leesburg melon variety and *Sechium edule*, *C.* [*Gloeosporium*] *manihotis* on cassava [ibid., xx, p. 564], *Cylindrosporium mori* on mulberry [ibid., xxii, p. 53], *Fabraea maculata* on quince, loquat [ibid., xxii, p. 364], and pear, *G. papayae* on papaw [ibid., xxvi, p. 114], *G. passiflorae* on *Passiflora* sp., *G. vanillae* Cooke [ibid., vi, p. 695] on leaves of Orchidaceae, *Melanconium bambusinum* on *Bambusa pallescens*, *M. fuligineum* on grapes [ibid., xxii, p. 126], and *Pestalotia dichaeta* on *Anacardium occidentale*, *Eucalyptus* sp., and mango.

GILMORE (L. E.). **The role of calcium, phosphorus, sulphur and superphosphate for Tobacco.**—*Sci. Agric.*, xxvii, 1, pp. 21–32, 1947.

In examining commercial calcium superphosphate as a fertilizer for tobacco a preliminary survey of the literature concerning the part played in plant nutrition by the three elements present, calcium, phosphorus [*R.A.M.*, xv, p. 263], and sulphur, is made. The effect of each on growth, yield, and quality of tobacco, and on soil reaction, is considered.

Calcium deficiency is uncommon because of the heavy fertilizer dressings usually applied, but when it does occur it causes stunting with browning and death of the terminal bud. Phosphorus deficiency also induces stunting and causes the leaves to become dark green, shiny, leathery, and narrowed at the base. In greenhouse experiments sulphur deficiency resulted in pale green leaves with white veins.

Concerning the soil reaction, its pH value bears an important relation to the development of black root rot [*Thielaviopsis basicola*: ibid., x, p. 762; xxv, p. 583] to which 80 per cent. of Canadian tobacco is susceptible. Values of over 6·4 encourage the pathogen, while values below 4·8 give a low yield of tobacco, accompanied by manganese poisoning. Soils with pH values between 5 and 5·6 produce the most satisfactory crops. As most Canadian tobacco soils are acid in reaction it is important to maintain the favourable pH range.

DAVIS (B. H.) & HAENSELER (C. M.). **Control of late blight of Tomato in New Jersey.**—Abs. in *Phytopathology*, xxxvii, 1, p. 6, 1947.

Tomato late blight (*Phytophthora infestans*) [*R.A.M.*, xxvi, p. 176 and above, p. 210] became prevalent in the canning areas of New Jersey during the first week in July and thenceforth spread almost continuously, reaching a peak of fruit destruction from 20th to 25th August. Spraying experiments were begun in a commercial field three days after the detection of scattered foliar infection, eight treatments being given at ten-day intervals, using a five-row power take-off sprayer with three nozzles per row, with (1) microgel, a tribasic copper sulphate containing 50 per cent. copper (4–100) [*R.A.M.*, xxiv, p. 266], (2) fermate (2–100) alternating with microgel, and (3) zerlate (2–100), each with an admixture of calcium arsenate (4–100), while the control plots were given (4) calcium arsenate and lime (4–8–100). The calculated yields in tons of marketed fruits per acre (based on the examination of 100 tomatoes in each treatment) were as follows: (1) 27·7, (2) 21·4, (3) 13·8, and (4) 10·2, of which 0·2, 2, 13·3, and 10·8 per cent., respectively, were slightly infected, while of the total quantity of fruits produced 0·7, 12·1, 55·9, and 59·8 per cent., respectively, were infected.

Report on Tomato blight and plant conference.—*Food Packer*, xxviii, 1, pp. 74, 76, 1947.

At a conference held at Indianapolis under the joint auspices of the National Canners' Association and the Indiana Canners' Association, which was visited by phytopathological and tomato specialists from 12 States, the committee on disease control expressed the opinion that control programmes should take into account not only late blight [*Phytophthora infestans*: see preceding abstract] (the immediate concern of the conference), but other leaf pathogens, e.g., *Septoria* [*lycopersici*], early blight [*Alternaria solani*], anthracnose [*Colletotrichum phomoides*], and leaf mould [*Cladosporium fulvum*]. Control measures should include autumn ploughing where practicable; rotation, avoiding tomatoes in succession to the same crop, potatoes, or other Solanaceae; wider spacing, allowing preferably 5½ to 6 ft. between rows and 2½ to 4 ft. between plants; the application of either of the two following spraying schedules: (1) zerlate alone (2–100), unless *P. infestans* or *S. lycopersici* threaten, in which case it should be replaced by fixed coppers (4–100), Bordeaux mixture, or dithane; (2) three zerlate alternating with two copper sprays. In either case treatment should begin about 30 days after the first cluster-bloom and continue thereafter at 10-day intervals or thereabouts, according to weather conditions. If an outbreak of late blight is anticipated, spraying should start earlier, using the coppers. Dusts are not generally as effective as sprays, but where they are used a 7 per cent. copper and a 10 per cent. zerlate dust, separately or together, should be applied weekly at the rate of 40 to 50 lb. per acre. In the application of the schedules, special attention should be directed to any fields, areas, or soil types where (1) leaf diseases have given trouble in the past, (2) adequate rotations are impracticable, or (3) during long, wet periods conducive to foliar diseases.

GÄUMANN (E.), JAAG (O.), & BRAUN (R.). **Antibiotika als pflanzliche Plasmagifte.** [Antibiotics as plant plasma toxins.]—*Experientia*, iii, 2, pp. 70–71, 1947. [English summary.]

In experiments on red beets and *Elodea canadensis*, lycomarasmin, the wilting agent produced by *Fusarium* [*bulbigenum*] var. *lycopersici* [*R.A.M.*, xxv, p. 424], did not destroy the semi-permeability of the plasma layer, but patulin (clavacin), derived from *Penicillium patulum*, *P. expansum*, *Aspergillus clavatus*, etc. [ibid., xxiii, p. 183], did so. In similar tests with *Chlamydomonas* lycomarasmin was also

less toxic than clavacin, while of the two Protozoa tested, *Colpidium* proved more sensitive to lycomarasmin and *Paramaecium caudatum* to clavacin.

LANSADE (M.). **Recherches sur le chancre du Peuplier en France.** [Researches on Poplar canker in France.]—*Ann. Épiphyt.*, N.S., xii, 1, pp. 23–39, 4 figs., 1946.

Preliminary investigations into poplar canker [*R.A.M.*, xiv, p. 478; xxv, p. 323] in France showed the presence of three main types of injury, viz., bark lesions, typical canker, and tumours. From the first, a species of *Diaporthe* was isolated from some trees and an organism closely resembling *Bacterium* [*Pseudomonas*] *syringae* from others; the second gave *Diaporthe* in some trees and a species of *Nectria* in others; while no organism was obtained from the tumours. Four isolates of *Diaporthe* were cultured, which appeared to fall into two groups, one (isolates 4 and 21) showing sparse perithecia in culture, a pycnidial stage of the *Fusicoccum* type, and ascospores obtuse at either extremity, and the other (isolates 23 and 26) with numerous perithecia, no pycnidial stage, and ascospores slightly mucronate at the extremities. In isolates 4, 21, 23, and 26, respectively, the perithecia averaged 304·3, 355·9, 355, and 392μ high by 271·9, 308·7, 292·9, and 290·4μ thick, the asci 48 by 6·4, 49·1 by 5·5, 46·4 by 5·3, and 46·6 by 4·7μ, and the ascospores 11·1 by 2·59, 10·9 by 2·18, 11·3 by 2·6, and 11·1 by 2·75μ. Inoculations of healthy poplars with isolate 4 gave rise to an extensive bark canker, and with 21 positive infection, the fungus penetrating the bark and showing a certain parasitic ability.

Five isolates of *Nectria* in culture produced only conidia; these were 69 to 97 by 5·25 to 7·5μ. On the cankers, the bright reddish perithecia were 230 to 370μ high by 150 to 300μ thick, the asci were 70 to 80 by 6μ and contained light, bicellular ascospores 10·5 to 15 by 3·75 to 8μ. Inoculations of healthy poplars with isolate 24 gave rise to the beginning of an open canker which did not seem likely to heal up.

Inoculations with the organism resembling *P. syringae* showed it to be parasitic on the herbaceous organs of poplar, lignification of the tissues rapidly arresting its progress. Its action was confined, in spring, to the destruction of leafy shoots and young bark; this organism hardly seemed able to cause typical cankers. The two isolates used for the inoculations were obtained from fissured lesions on one-year-old twigs of *Populus koreana* and *P. simonii*, both highly susceptible to frost injury. Further work is in progress.

BOUDRU (M.). **La rouille 'suisse' des aiguilles du Sapin de Douglas.** ['Swiss' rust of the needles of Douglas Fir.]—*Bull. Soc. for. Belg.*, lii, 7–8, pp. 60–68, 1 pl., 1945.

A brief account is given of the morphology, taxonomy, symptoms, development, and geographical distribution of needle cast (*Phaeocryptopus gaeumanni*) of Douglas fir (*Pseudotsuga taxifolia*) [*R.A.M.*, xvii, p. 638; xxv, p. 428]. The disease was found in July, 1943, in the arboretum at St. Michel (St. Hubert), Belgium, on two non-contiguous groups of trees (green variety) planted in 1925. The affected trees were completely bare, except for a small bunch of the current season's needles. Other Douglas firs in their immediate proximity and elsewhere in the vicinity were unaffected. At the time, no other cases were known in Belgium, but subsequently the disease was observed in several other localities.

BOUDRU (M.). **La rouille des aiguilles du Thuya géant (Thuja plicata Don).** [Needle rust of the giant *Thuya* (*Thuja plicata* Don).]—*Bull. Soc. for. Belg.*, lii, 7–8, pp. 69–75, 6 figs., 1945.

A brief account is given of the symptoms, causal organism, and control in the nursery of the disease of *Thuja plicata* seedlings caused by *Keithia* [*Didymascella*]

thujina [*R.A.M.*, viii, p. 279; xxv, p. 18], which for some years past has decimated the young nursery trees at Groenendael, Belgium, though, apparently, it has not previously been recorded in that country. *Coryneum thujinum* occurred occasionally on the same needles as *D. thujina*. From dead infected leaves kept in a moist chamber the author also isolated a fungus closely resembling *Pestalozzia funerea* [ibid., ix, p. 145.].

HINTIKKA (T. J.). **Ruskotäplistä Thuya occidentalis en puusa.** [Brown spots in the wood of *Thuja occidentalis*.]—*Memor. Soc. Fauna Flora fenn.*, *1940–1*, xvii, pp. 279–283, 2 figs., 1942. [Received February, 1947. German summary.]

The elongated, brown, apparently resinous areas seen in transverse sections of the trunk of a *Thuja occidentalis* blown down by a storm in the garden of a Finnish horticultural institute in 1925 were surrounded by a white rot attributed to *Armillaria mellea*. The tree is believed to have reacted to the stimulus of the parasite by the production of adventitious buds (blastomania), the death of which was followed by the development of the brown zones.

ROBAK (H.). **Tre skogsykdommer som hittil har vaert lite kjent eller påaktet i Norge.** [Three forest diseases which have hitherto been little known or heeded in Norway.]—*Tidsskr. Skogbr.*, *1946*, 10–11, pp. 323–334, 2 figs., 1946.

Jørstad has published the available information [*R.A.M.*, xxv, p. 184] as to the distribution of *Phomopsis pseudotsugae* on Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*] and other conifers in Norway, where it was first discovered by Hahn in 1925 [ibid., x, p. 278]. The earliest record for the country of the fungus on larch dates from 1943, when the author detected it at Svarstad, Bremanger; in 1944 a number of further collections were made in various localities. The symptoms of infection were absolutely uniform on all the trees examined, the three- to five-year-old branches being dead and the needles shrivelled. The desiccation had evidently taken place suddenly, when the needles were almost or quite fully grown. The necrotic area of the branch is fairly well differentiated from the healthy part below it, but in some of the cases investigated the line of demarcation was not as sharp as in Ferdinandsen and Jørgensen's illustration [ibid., xviii, p. 212]. A copious flow of clear resin was generally exuded from the base of the dead branch, at and a short distance above which were formed the pycnidia of the fungus. In 1945 *Phomopsis pseudotsugae* was observed on two 11-year-old *Larix leptolepis* trees, and in 1946 on a 19-year-old specimen of the same host; on these larches some of the older branches had also been killed. In 1946, moreover, one of the lowest branches of an outside tree in a thriving 39-year-old plantation was found to have been killed by the fungus in the previous year.

The modest extent of the damage hitherto inflicted by *P. pseudotsugae* in Norway does not preclude the possibility of future severe outbreaks under more propitious meteorological conditions. In the meantime the sporadic distribution of the pathogen should facilitate the wise precaution of cutting off and burning any dead branches as soon as they are detected in the spring.

According to Jørstad [op. cit.] there was only one Norwegian record, dating from 1900, of *Meria laricis* on larch [ibid., xxiv, p. 37] before the present writer encountered the needle-fall in three plantings near Førde, in two of which the trees were just under or over 20 and in the other about 13 years old. When the older plantations were revisited in 1946, the trees had largely recovered from the effects of the disease, which included withering of practically the entire crown and shedding of the current year's needles. The younger stand, however, presented a very unthrifty appearance when first inspected, many of the trees being dead and others stunted, while the needles were either desiccated or fallen. Later in the same year the disease was observed in an advanced stage on about ten trees in a small

11-year-old planting, and further cases of mild or limited infection on 15-to 20-year-old larches were inspected in different localities. In 1946 *L. sibirica* and *L. leptolepis* were also found to be attacked, the damage to the former being appreciable. On the 40-year-old European larches and 10-year-old *L. leptolepis* in a mixed planting the symptoms were almost imperceptible to an untrained eye.

Thirty-year-old spruces were observed in 1942 to be severely infected by *Discella strobilina* (Desm.) Died. (*Ascochyta parasitica* (Hart.) Rostr.) [*A. piniperda*: ibid., xii, p. 667], which had evidently been established on the trees for some years. The young growth killed by the fungus had been largely replaced by adventitious shoots, some of which were also infected: roots and stems were healthy.

Bier (J. E.) & Nobles (Mildred K.). **Brown pocket rot of Sitka Spruce.**—*Canad. J. Res.*, Sect. C, xxiv, 6, pp. 115–120, 3 figs., 1 pl., 1946.

A brown pocket rot of Sitka spruce (*Picea sitchensis*), caused by *Lentinus kauffmanii* n.sp., occurs in patches in the Queen Charlotte Islands, British Columbia, and is responsible for the decay of the merchantable timber of many of the largest trees, while producing no external symptoms in living trees. This rot appears to be identical with an unidentified pocket rot briefly described by Mounce in 1926 [*R.A.M.*, vi, p. 265].

The disease is distributed quite generally in the Islands; cultures have been isolated from trees in Alaska, Washington, and Oregon, and sporophores have been reported on spruce in California, so that the distribution probably coincides with that of the spruce. The fungus causes brown pockets of decay in the heartwood and occurs most frequently in the lowest 80 ft. of the trunk. The first indications of infection are minute, discoloured pockets which increase in size and become filled with a crumbly, brown mass, readily breaking into cubes with felts of white mycelium in the cracks. Finally the decayed wood drops out, leaving lens-shaped cavities edged with rot, 12 to 24 by 4 to 8 in., elongated in the direction of the grain. Although distinctly delimited at first, the pockets eventually coalesce to form a continuous cavity. Because of the localized nature of the rot, it is impossible to estimate the decay from the cut ends of the trunk. Of 1,977 trees examined, 1,414 were infected with some fungus and of these 91 were cases of brown pocket rot, which was sixth on the frequency list of decay-producing fungi. In these trees 11·5 per cent. of the total merchantable timber was destroyed by decay, of which 0·9 per cent. was due to brown pocket rot, a percentage exceeded only by cork rot (*Fomes pini*) [ibid., xxv, p. 531], brown butt rot (*Polyporus schweinitzii*) [ibid., xx, p. 552], and brown crumbly rot (*F. pinicola*) [ibid., xix, p. 445; xx, p. 1, *et passim*]. In grade 1 logs 7·6 per cent. of the timber was decayed, 1·6 per cent. being due to the brown pocket rot, a percentage exceeded only by brown butt rot. There is no foundation for the popular belief that the rot affects every tree in a group.

An analysis of the entry points of the fungus indicates that in 56 per cent. entry is through the roots, in 39 per cent. through scars or branch stubs, and in 5 per cent. through dead tops.

No outward symptoms were observed in standing trees. The sporophores develop only on felled and exposed timber, usually in May, June, September, and October on the rim of decayed pockets. The causal fungus appeared to be an undescribed species, and a full description is presented by Dr. A. H. Smith of Michigan University, who named it. The dry, glabrous, convex pileus, 3 to 8 cm. broad, with a margin at first incurved and later wavy or lobed, varies from buff to dull tan, has tough, cartilaginous, pinkish flesh, crowded, adnate gills, decurrent by ridges extending 1 to 2 cm. down the stipe, and smooth, hyaline, subcylindrical or slightly curved spores 5 to 6 by 2μ; the stipe is 3 to 6 cm. by 5 to 12 mm., equal, solid, central to nearly lateral, and concolorous; cystidia are abundant, and subcylindrical

to ventricose. It differs from *L. umbilicatus* in lacking the acrid taste, and in its spores and convex pileus, and from *L. adhaerens* [ibid., xv, p. 332], which it otherwise closely resembles, in lacking the viscidity, odour, and taste of that species, and in the smaller size of its spores.

Cultures obtained from spores, fruit bodies, and infected wood were characterized by a strong-smelling mycelium, white when young, pinkish-buff when old, and developing scattered, compact nodules 1 to 10 mm. in diameter, with a felty to skin-like surface and of a quite distinctive appearance. The advancing hyphae were thin-walled and branched with clamp-connexions, while the aerial hyphae became nodose-septate or fibrous and thick-walled.

RIKER (A. J.), GRUENHAGEN (R. H.), ROTH (L. F.), & BRENER (W. H.). **Some chemical treatments and their influence on damping-off, weed control, and winter injury of Red Pine seedlings.**—*J. agric. Res.*, lxxiv, 3, pp. 87–95, 1947.

A tabulated account is given of greenhouse and nursery experiments in Wisconsin between 1937 and 1945 in the control of red pine (*Pinus resinosa*) seedling damping-off (*Pythium irregulare* and *Rhizoctonia* [*Corticum*] *solani*) [*R.A.M.*, xxiii, p. 197], the object of which was to find a treatment combining toxicity to the pathogens with freedom from the adverse effects of dilute sulphuric acid on the nutritional balance in sandy soils. Scots and Austrian pine (*Pinus sylvestris* and *P. nigra* [var. *austriaca*]) were included in some of the trials. Reasonably satisfactory results were secured by seed treatment with a mixture of 8 per cent. mercuric phenyl cyanamide and 2·5 per cent. cadmium oxide (barbak C), supplemented by the application to the soil of calomel [mercurous chloride] at the rate of 0·4 gm. per sq. ft. In a limited number of trials, moreover, a soil treatment with tetramethyl thiuramdisulphide [Du Bay 1205–FF] was relatively effective not only against damping-off but also in the elimination of weeds and protection from winter injury.

BAZAN DE SEGURA (C.). **Una nueva enfermedad del Haba (Vicia faba L.) en el Peru.** [A new disease of the Broad Bean (*Vicia faba* L.) in Peru.]—*Agronomia, Lima*, x, 42, pp. 49–52, 3 figs., 1945. [English summary.]

A new disease of broad beans (*Vicia faba*) in Peru is characterized by the presence on the pods of roughly spherical, black, water-soaked, velvety spots which coalesce to cover almost the entire surface. The fungus isolated from the infected tissues was identified as a species of *Phoma* with a white, later greyish, cottony mycelium, giving rise to numerous more or less globose, black pycnidia with a circular ostiole, and minute, elliptical, straight, hyaline, frequently biguttulate conidia. Positive results were obtained in inoculation experiments with the pathogen, which is suspected to be identical with *P. subcircinata*, the agent of a very similar infection of beans [*Phaseolus vulgaris*] in the United States [*R.A.M.*, xxiv, p. 260].

Marked damage by brown stem rot.—*Soybean Dig.*, vii, 1, p. 17, 1946.

According to B. KOEHLER, Illinois soy-bean crops sustained heavy damage from brown stem rot in the autumn of 1946. First discovered in the autumn of 1944, the disease has continued to spread and become increasingly serious. The most prominent external symptoms are the blanching and brown discoloration of the interveinal foliar tissues, while the interior of the stems, especially near the base, is also brown. Pending further investigations, the best suggestions that can be made for control are crop rotation, including soy-beans only once in three or four years, the application of limestone where needed, and a well-balanced soil fertility programme. The [unnamed] pathogen is soil-borne, and infection does not appear to be carried on the seed.

MIDDLETON (J. T.). **Pythium crown rot of Rhubarb.**—*Bull. Torrey bot. Cl.*, lxxiv, 1, pp. 1–8, 2 figs., 1947.

This fuller account of a crown rot of rhubarb associated with several species of *Pythium* [*R.A.M.*, xxi, p. 119] observed in March, 1936, near San Francisco Bay, and in February, 1940, near Los Angeles, contains the following additional information. Plants in several fields in each locality were affected, and it was apparent that the disease occurs regardless of soil type and irrigation practice. The infected plants usually wilted, the leaves then turning yellow and collapsing. The bases of the petioles generally showed sunken, longitudinal, brown streaks ¼ to ½ in. wide, extending upwards for 2 to 3 in. Some young buds escaped infection until at or above soil-level, although the disease seldom developed much above ground-level; when it did, its progress depended upon the presence of a moist atmosphere. In some plants only the roots were attacked, the cortex becoming flaccid and water-soaked.

Isolations from affected material gave *P. anandrum*, *P. oligandrum* [ibid., xxvi, p. 132], *P. ultimum*, *P. irregulare*, and *P. splendens*, the last two new records for rhubarb. The minimum, optimum, and maximum growth temperatures were usual for the five species. All were found by inoculation to be pathogenic to 2-, 6-, and 12-month-old rhubarb plants, *P. ultimum* being the most and *P. irregulare* and *P. oligandrum* the least virulent.

ASTHANA (R. P.). **Bacterial leaf-spot on Arum.**—*Curr. Sci.*, xv, 12, p. 356, 1946.

In July, 1944, *Colocasia antiquorum* leaves in the Nagpur district of India were observed to bear round to oval, dark sage-green spots, roughly disposed in streaks, which in three to four weeks attained a diameter of 0·5 mm. to 1 cm. and later coalesced to form larger pale yellow to light brown patches. The streaks were mostly on the upper surface and during the rainy season only a few scattered lesions developed on the lower, but in the winter they were equally prominent on both, those on the under side being eucalyptus-green. The affected foliage lost its lustre, shrivelled from the margins inwards, and died after a few days. The disease was promoted by an excess of soil and atmospheric humidity and was more severe on young than on older leaves. The disease also attacked *Alocasia indica* and caused considerable losses in both plants. The bacterium isolated from infected material formed round, smooth, sunken colonies on glucose agar, while on agar streaks the growth was smooth, soft, spreading, with a slimy, finely ridged surface. The organism is motile, highly refractive, rod-shaped, 1·33 to 3·13 by 0·66 to 1·33 (average 2·13 by 0·93) μ. Inoculation experiments gave positive results on both leaf surfaces, the symptoms appearing within 24 hours on the lower and 48 on the upper side during the rainy months and after three to four days in the winter. Re-isolations from the infected leaves yielded the same organism, which has not yet been identified. Cross-sections through the diseased foliage revealed its presence in the parenchymatous tissues and palisade cells.

FRANÇOT (P.) & LEVADOUX (L.). **Observations faites en 1945 sur le brenner ou rougeot parasitaire de la Vigne.** [Observations made in 1945 on 'brenner' or parasitic 'rougeot' of the Vine.]—*Progr. agric. vitic.*, cxxv, 14–15, pp. 226–227, 1946.

During 1945, 'brenner' disease (*Pseudopeziza tracheiphila*) [*R.A.M.*, xxv, p. 327 and next abstract] caused important losses in several vine-growing areas of France. As it is probably of European origin, since it has long been known in France, factors for resistance are to be sought in European, not American, vine varieties. All exotic vines, including 'virgin' vines, appear to be susceptible. The outbreak in Champagne closely resembled that in several other localities; a first attack

confined to the areas infected in 1944 was followed by another affecting all the vineyards in the vicinity. Severe damage was caused to the young fruit clusters, some of which entirely failed to set, though no direct infection of the fruit was observed. Surveys in numerous vineyards showed that timely applications of copper sulphate had in every case afforded adequate protection. It appeared that when spraying was carried out a few days before the rain which effects the spread of the disease, the protection given was adequate, but if spraying was delayed it became useless. One application was of no value unless shortly preceding the period of contamination.

In conclusion, it is stated that spraying against *P. tracheiphila* must be practised preventively. When the meteorological data are insufficient to predict the date of an outbreak, the timing of the first spray application must take into account the likelihood of attack, depending on the formation of apothecia and the conditions governing spore formation. The number of treatments required and the dates on which they are to be given are governed by the rate of growth of the branches during the dangerous period.

LEVADOUX (L.). **La lutte contre le brenner.** [The control of 'brenner'.]—*Progr. agric. vitic.*, cxxvi, 46–47, pp. 309–311, 1946.

In spraying tests carried out in Champagne in 1946 against 'brenner' disease of the vine [*Pseudopeziza tracheiphila*: see preceding abstract] by Françot and Mauro, using 4·5 per cent. Bordeaux mixture, a vine sprayed on 24th April, 11th May, and 23rd May later had a disease rating of 0·23, the corresponding figure for one treated on 24th April and 11th May being 0·32, and for a third sprayed only on 24th April, 0·87, as against a rating of 1 for five control vines sprayed on 4th June.

In Switzerland, Gallay, Staehelin, and Wuergler obtained similar results, a plot sprayed with 2 per cent. Bordeaux mixture as from 25th April later having 12 leaves per vine attacked, one sprayed as from 18th May showing 40, and a third, sprayed from 31st May, having 58.

In those parts of France in which the vines were sprayed with Bordeaux mixture following official spray warnings the vines were only very slightly attacked, as in Burgundy (Côte d'Or) where losses from brenner were avoided by all growers who sprayed.

LEVADOUX (L). **Chronique du court-noué. II.** [Notes on court-noué. II.]—*Progr. agric. vitic.*, cxxvi, 48–49, pp. 341–342, 1946.

Referring to the view expressed by S. Pontailler (*J. France agric.*, 23rd November, 1946) that the virus nature of vine court-noué disease [*R.A.M.*, xxvi, p. 94 and next abstracts] has not been established and therefore the inspection and large-scale eradication called for by Branas are premature, the author points out that Branas's recommendations were made precisely because the disease is in fact transmissible by budding and grafting, because a soil in which affected vines have been grown continues to transmit the disease to newly planted vines for many years, and because the disease is still slowly spreading.

BRANAS (J.), BERNON (G.), & LEVADOUX (L.). **Nouvelles observations sur la transmission du court-noué de la Vigne.** [New observations on the transmission of court-noué of the Vine.]—*Progr. agric. vitic.*, cxxv, 1–2, pp. 20–25; 3–4, pp. 42–48; 5–6, pp. 82–83, 7 figs., 1946.

From vines affected with court-noué [*R.A.M.*, xxv, p. 491; xxvi, p. 94 and next abstracts] the authors isolated a fibre-like protein. All attempts to induce the disease by inoculation of healthy vines with crude juices from affected vines or with more or less purified extracts gave negative results. To investigate the part

played in transmission by *Phylloxera* [*vastatrix* f. *radicicola*] six pots of soil in which vines had not been grown for many years were planted on 3rd February, 1944, each with four Rupestris du Lot cuttings, previously disinfected. Pots 1, 5, and 6 were the controls, but 5 and 6 became contaminated with *Phylloxera*. Pot 2, on 3rd February, received pieces of affected root of 33 M. de G. vines, and pot 3 on 19th June received affected 3·905 C roots. On 25th August, pot 4 was given affected 404 C roots bearing living *Phylloxera*. On 30th July, 1945, the figures for court-noué assessed according to an arbitrary scale (0 unaffected to 5 markedly affected) for the six pots were, respectively, 1·5, 2, 2, 2·5, 3·5, and 2·5. From a further test in which affected pieces of roots were washed, brushed, and disinfected before insertion, it was apparent that when such disinfected roots were used the severity of the disease a year later was not greater than that of the control. All pots, however, were contaminated with *Phylloxera*.

A third experiment was carried out, in 1944, using soil from an affected area. Pots 11 and 17 were filled with non-contaminated soil (control), pot 12 with court-noué soil sieved and freed from root debris, pot 13 with clean soil plus 3 per cent. sieved 'affected' soil, pot 14 plus 45 per cent. sieved 'affected' soil, and pot 16 'affected' soil not sieved. In August, 1945, all had *Phylloxera*, 13 having the least, and the disease ratings were, respectively, 2·5, 2, 4, 2·5, 3·5, and 4. This result suggests that intensity of the disease is proportionate to the number of active vectors.

In a fourth experiment seedling Gamay plants, grown in clean soil, were transplanted at the time of inoculation to pots of similar soil. Pot 101 was inoculated with an egg of root-inhabiting *Phylloxera* from an affected plant; pot 102 inoculated with a Gamay root bearing 30 fixed insects of which some were young and active; pot 103 plus 7 root-inhabiting *Phylloxerae*; pot 105 plus 7 *Phylloxerae*, all active except one, from affected 17 C; pot 106 plus 40 *Phylloxerae*, in all states from the same source. On 30th July, 1945, no *Phylloxerae* could be seen in any of the pots; plant 101 showed no apparent court-noué, 102 showed a few old, dried-up [root] knots, 103, foliar distortion and numerous old root knots; 105, two distinctly variegated leaves and old knots, while 106 showed marked variegation on two leaves, and old, rotting knots. While these results do not prove that court-noué is transmitted by root-inhabiting *Phylloxera* none of the facts observed is against such an hypothesis.

In other inoculation experiments *Phylloxera* leaf galls from affected vines buried in the soil appeared to aggravate the disease (2·5 in control, 3·5 to 4·5 in the inoculated plants), particularly when the inoculations were made later in the season (September).

When seeds from a healthy Gamay vine were sown on 2nd February, 1944, in pots of earth taken at a depth of 30 cm. and 1 m., respectively, from a place where an affected vine had been dug up in 1938, and where lucerne had since been grown, two plants developed marked *Phylloxera* infestation, remained sickly, and showed variegation and foliar deformation.

As far as they go the results obtained are in conformity with the view that root- and gall-inhabiting *Phylloxerae* are both able to transmit court-noué, and that, with the former, the effect of inoculation appears to depend on the number of insects able actively to intervene.

Bellet (H.). **Le court-noué en Haute-Savoie.** [Court-noué in Haute-Savoie.]—*Progr. agric. vitic.*, cxxv, 9–10, pp. 163–164, 1946.

During the last three or four years the vineyard of Bas-Faucigny, Haute Savoie, situated at an altitude of 450 m. on the steep slopes beside the river Arve, has become affected by court-noué [see following abstract]. The stock is the Gringet or Savagnin variety, which is rather susceptible. The soil favours the presence of *Phylloxera* [*vastatrix* f. *radicicola*]. The outbreak appeared as a generalized

invasion, all the vines presenting much the same symptoms. Heavy rain in autumn causes soil to accumulate at the foot of the vines; this soil is later removed by the growers higher up the slope, only to be washed down again later on, with the result that the dispersal of the insects is probably facilitated.

BRANAS (J.). **La lutte contre les parasites en 1946.** [Control of parasites in 1946.]—*Progr. agric. vitic.*, cxxv, 16–17, pp. 254–258, 1946.

Since 1940, the control of vine diseases in France has been rendered difficult and ineffective as a result of a lack of fungicides. In most cases, however, the economic results have not been conspicuous. They were most marked in relation to *Oidium* [*Uncinula necator*: *R.A.M.*, xxvi, p. 4], disastrous outbreaks of which occurred in 1944 and 1945 on susceptible vines and in areas which, like the south of France, are climatically favourable to the disease. Mildew [*Plasmopara viticola*: ibid., xxv, p. 488] was slight or nil, but the latent threat of it was a constant source of anxiety. As a result of these circumstances a wider use was made of vine varieties more resistant to diseases than the ungrafted hybrids.

The need to economize in copper caused growers to postpone as long as possible the application of the first spray, which favoured the spread of diseases that develop early, i.e., black rot [*Guignardia bidwellii*: ibid., xxv, p. 489] and brenner [*Pseudopeziza tracheiphila*: see above, p. 225]. Black rot increased notably in Armagnac in 1942 and brenner in Champagne in 1945.

GAROGLIO (P. J.). **Nouvelles recherches sur les soufres dans la lutte anticryptogamique.** [New researches on sulphurs in the control of fungi.]—*Rev. Vitic., Paris*, xcii, 13, p. 393, 1946.

Referring to the economy that can be effected by dusting vines preventively with sulphur against *Plasmopara viticola* and *Uncinula necator*, the author mentions recent researches showing that the fungicidal effect is increased nearly threefold when yellow, refined, ground, and ventilated sulphur is activated by the addition of clay, carbonate of lime, or bentonite and given a dark pigmentation [*R.A.M.*, xxvi, pp. 5, 43].

In Italy, the best natural sulphur already exists in the colloidal state, mixed with clay, both in the Romagna and in Irpinia, crude sulphur from the latter locality having in the author's experiments always given excellent results. No burning was caused to the berries or leaves, adhesiveness was effective and in direct relation to efficacy and economy, and the dark pigmentation increased fungicidal activity. Crude forms of sulphur, ventilated and containing about 30 per cent. sulphur, can be recommended unreservedly.

BERNON (G.). **A propos de la lutte contre l'Oidium.** [On the control of *Oidium*.]—*Progr. agric. vitic.*, cxxii, 13–15, p. 117, 1945. [Abs. in *Ann. Épiphyt.*, N.S., xii, 1, p. 70, 1946.]

In the author's opinion, the best method of applying sulphur against vine *Oidium* [*Uncinula necator*: *R.A.M.*, xxv, pp. 489, 490; xxvi, pp. 4–6] is to make the first application, using wettable sulphur, when the last bud to develop is 5 cm. long; the second and third applications should be made with powdered sulphur. The wetters used in the manufacture of copper mixtures give excellent practical results with sulphur, provided an excessive quantity is not employed. The sulphur is used at a dosage of 4 per cent.

BERNON (G.). **Le mildiou en 1946.** [Mildew in 1946.]—*Progr. agric. vitic.*, cxxvi, 50–51, pp. 366–370, 1946.

During 1946, vine mildew [*Plasmopara viticola*] was less prevalent and intense in France than it was in 1932, a catastrophic year, although in 1946 from bud-break

to flowering all the conditions except one, a prevailing temperature two or three degrees too low (average for May, 16·95° C.) favoured a severe outbreak. In June, 1932, however, 141·9 mm. of rain fell, evenly distributed over the month, whereas the June rainfall in 1946 amounted to 16·6 mm., and occurred about the middle of the month. After flowering hot, dry weather supervened, with the result that spread was slight and the yield, on the whole, not much affected. Serious losses, where they occurred, were due to negligence.

Perotti (R.). **Note fitopatologiche per gli anni 1939–41.** [Phytopathological notes for the years 1939–41.]—*Ann. Fac. agr. Pisa*, N.S., v, pp. 117–135, 4 figs., 1 graph, 1942. [French, German, and English summaries. Received March, 1947.]

This report contains, *inter alia*, the following items of interest. During the period under review the most prevalent diseases of fruit-trees in the vicinity of Pisa were *Clasterosporium carpophilum* [*R.A.M.*, xxiii, p. 68] and *Phyllosticta persicae* [ibid., xix, p. 582] on peach leaves, root galls on the same host caused by *Bacterium tumefaciens*, and a peach wilt with the appearance of leptonecrosis [ibid., xxvi, p. 19]. Pears growing to windward of *Juniperus* were rather extensively attacked by rust (*Roestelia cancellata*) [*Gymnosporangium sabinae*: ibid., xix, pp. 134, 582; xx, p. 382]. Vines were affected sporadically by *Coniothyrium diplodiella* [ibid., xxiii, p. 206; xxv, p. 153], which appears to be spreading locally. Chestnut groves showed new foci of infection by ink disease [*Phytophthora cambivora*: ibid., xxv, pp. 153, 191]. A branch of maritime pine [*Pinus pinaster*] showed infection by *Cronartium asclepiadeum* [ibid., xxii, p. 468].

Twentieth Annual Report of the Department of Scientific and Industrial Research, New Zealand [1945–1946], 110 pp., 1946.

In this report [cf. *R.A.M.*, xxiv, p. 493] it is stated that Granny Smith apples from five orchards usually producing fruit particularly susceptible to superficial scald [ibid., xxii, p. 316; xxiii, p. 473; xxv, p. 507] were wrapped in oiled paper immediately after picking, subjected to seven different treatments (i.e., immediate storage at 32° F. after picking or storage after first holding for from one to six weeks at air temperature). In store, no superficial scald developed until mid-January, long after the optimum storage period had elapsed. But when samples were removed and kept at air temperature for seven days nearly 100 per cent. developed scald by November. The general commercial practice with Granny Smith is to allow 14 to 21 days to elapse before wrapping and storage. In previous experiments [loc. cit.] it was consistently noted that when Granny Smith apples were wrapped in oiled paper a few hours after picking, they remained free from scald in storage. It seems evident that the prevalence of scald in commercially stored fruit results from neglect of this practice.

By November, considerable damage was caused in storage by breakdown and core flush [ibid., xxiii, p. 473]. The best control resulted by delaying storage for six weeks, but this method cannot be recommended as it increased fungal attack and pit, and the fruit turned so yellow as to be unsaleable. Four years' experiments have shown that no advantage accrues from delayed storage of Granny Smith. Other storage experiments with Granny Smith showed that severe core flush developed in fruit from trees worked directly on to Northern Spy rootstock, but was greatly reduced in fruit from those with Reinette du Canada as intermediate.

In cold storage, Cox's Orange Pippin apples from trees given phosphate, nitrogen, and potash kept as well as fruit from the untreated controls. The former showed somewhat more internal breakdown, but less storage pit, and less superficial scald. Nitrogen applications heavily increased breakdown and fungal attack, but

somewhat reduced pit and scald. An experiment on date of picking gave rather different results from those of previous years; breakdown fell to a minimum and pit rose to a maximum in early March, at about the third and fourth weekly pickings. Ammonium sulphate again induced much more breakdown and fungal attack than dried blood. With Dunn's Favourite, the fruit from untreated trees showed much better keeping qualities than from those treated with nitrogen or phosphate, nitrogen, and potash. Nitrogen applications caused a marked rise in breakdown and superficial scald. Jonathan gave a heavy crop which kept very well in storage. Fruit from trees receiving 4 lb. (but not 2 lb.) ammonium sulphate in addition to a basic dressing throughout of phosphate and potash showed increased breakdown, fungal attack, and lenticel spot [ibid., xxi, p. 457; xxii, p. 468; xxiv, p. 92]. In Jonathans from trees given potash plus phosphate and nitrogen, breakdown was less than in those without potash. With Sturmer there was again a marked incidence of breakdown and fungal attack in fruit from trees given nitrogen only. When the nitrogen was balanced by phosphate or by phosphate and potash, storage quality equalled that of the controls.

In work by the Plant Diseases Division, Auckland, peach trees inoculated in 1941 with the crown-gall organism [*Bacterium tumefaciens*: cf. ibid., xxiv, p. 65] all developed typical galls, were stunted, grew poorly, and averaged two-thirds the weight of the controls. The citrus canker organism [*Xanthomonas citri*: ibid., xxiv, p. 493] was isolated from two citronelle trees growing on waste land near Kerikeri, and the disease was also found in two small, non-commercial orchards in Gate Pa district, Tauranga. *Verticillium dahliae* was isolated from wood of wilted apricot trees in various areas in Central Otago, all the affected trees growing on land previously planted with tomatoes. 'Green crinkle', not uncommon in apples and pears, and closely resembling 'false sting' [ibid., xxii, p. 438], was ascertained to be carried in the scion wood. *Glomerella cingulata* was isolated from fruits of *Acmena floribunda*, which indicates that this plant should no longer be used as a shelter-hedge round apple and pear orchards. Dithane and fermate (both at 2–100) gave encouraging results against black spot [scab: *Venturia inaequalis*: cf. ibid., xxiv, p. 63; xxvi, pp. 46, 63] on apples. Dithane was more effective than the standard lime-sulphur and colloidal sulphur sprays; it russeted the fruit, but not sufficiently to affect grading. Fermate gave control comparable with the standard sprays, but the residues were conspicuous and difficult to remove.

The report from the Cawthron Institute, Nelson [cf. ibid., xxv, p. 26], confirms the observations of the preceding year that Cox's Orange Pippin, Jonathan, and Sturmer apple-trees at Braeburn and Tasman given magnesium treatments in 1939–40 and 1940–41 are benefiting more from the ground dolomite than from the magnesium sulphate or magnesium carbonate [cf. ibid., xxv, p. 120]. Two 12-lb. applications have given slightly better and more lasting effects than one. The treatments, which have not been renewed, are becoming ineffective but in view of the severity of the magnesium deficiency on some of the trees at the start, the length of time over which the applications have sustained their effects is considered satisfactory.

A chlorosis of the young apical leaves of Delicious trees observed annually in parts of the Nelson District was severe in 1945 but the cause of the condition remains undetermined. Of fungi isolated from mature apple trees suffering from die-back associated with poor or injured roots, six occurred commonly, viz., *Valsa leucostoma*, *Diplodia* sp., and *Physalospora obtusa* (black rot) on the upper branches, and *Polystictus versicolor* (heart rot), *Stereum purpureum*, and black rot on the main limbs and trunk. The evidence suggested that soil factors and mechanical injury to the trees are the primary causes, *S. purpureum* and *P. versicolor* then making rapid headway and finally killing the trees. When dead leaves under Glou Morceau pear and Dougherty apple trees were sprayed with elgetol in early spring

shortly before spore discharge [by *Venturia pirina* and *V. inaequalis*], scab infection was delayed and its severity reduced [cf. ibid., xxv, p. 348].

Breeding for resistance to blind seed disease (*Phialea temulenta*) [ibid., xxv, p. 263] in rye grass [*Lolium* spp.] was continued by the Grasslands Division (p. 48). The disease threatens to ruin the rye grass seed trade in many parts of New Zealand, and appears to be spreading. Surveys of the disease at the Canterbury Agricultural College (p. 70) indicate that abnormal rainfall at sowing time is the most significant contributing factor.

Work by the Plant Diseases Division (pp. 51–53) confirmed the high resistance of the Sensation swede to turnip mosaic [cf. ibid., xxiv, p. 438; xxv, p. 54], and showed that the new variety, Dryland, is almost equally resistant. In further work on breeding garden pea varieties immune from pea mosaic [cf. ibid., xxiv, p. 132], of 18 hybrids tested only one was susceptible. An aphid-transmitted virus disease was found in tree tomato [*Cyphomandra betacea*]. The natural host range [in New Zealand] of spotted wilt [tomato spotted wilt virus] was extended by the inclusion of Calla lily [*Zantedeschia* sp.] and garden pea. A comprehensive investigation of the cause and control of yellow leaf of *Phormium tenax* [ibid., i, p. 295] was begun; that the symptoms were produced experimentally without the use of any pathogen suggests that the condition may be of physiological origin. Maize head smut [*Sphacelotheca reiliana*: cf. ibid., xxv, p. 364] was ascertained to be soil- and seed-borne. Four applications of Bordeaux mixture (3–4–50) at monthly intervals in winter almost completely controlled passion fruit grease spot (*Phytomonas passiflorae*) [ibid., xxiv, p. 459] and brown spot (*Alternaria passiflorae*) [ibid., xxi, p. 364]. Soil disinfection with formalin (1–50 to 1–80), paraformaldehyde (1–25 and 1–50), and chloropicrin gave good control of *Verticillium*, while D.D. was also satisfactory. During extensive investigations on methods of proofing canvas and other materials against fibre-destroying fungi [ibid., xxv, p. 176] it became apparent that it is necessary in this type of work to use several test organisms, since of the four selected, *Stachybotrys*, *Metarrhizium* [? *glutinosum*], *Chaetomium* [? *globosum*, ibid., xxv, p. 367, and below, p. 254], and *Memnoniella* [*echinata*: cf. ibid., xxiv, pp. 282, 380, 428], the first was more tolerant towards copper soaps, and the second was more tolerant towards pentachlorophenol, than the others. Of products tested for proofing rope and cordage against fungi, copper naphthenate (0·5 per cent. metal) was the most effective. Creosote-treated cordage showed a loss of 30 per cent. in tensile strength.

Co-operative work on tobacco research (pp. 57–59) by the Cawthron Institute and the Research Station was continued. A survey of plantations showed that the improvement in control of mosaic was being maintained [ibid., xxiv, pp. 6, 493], but high incidence occurs almost every year in several gardens.

In work at the Cawthron Institute (p. 66), steam treatment, chloropicrin, and 2 per cent. formalin all reduced tomato hard core [ibid., xxiv, pp. 6, 209], as did soil applications of cocoa-bean husks, sheep manure, and fertilizers, particularly potassic ones mixed with nitrogen. Incidence was highest on no-manure plots and those without potash.

Studies at the Canterbury Agricultural College showed that when Blue Prussian and William Massey peas were grown in unsterilized soil at 50, 70, and 90 per cent. moisture saturation capacity, one series at 56° to 116° F. and the other at 34° to 69°, seed treated (at 2 oz. per bush.) with agrosan, copper carbonate, spergon, and cuprous oxide germinated significantly better than undusted seed, cuprous oxide giving significantly the best result. No dust afforded the plants any protection from natural soil infection after emergence. Wound inoculations with *Botrytis cinerea* of Sweet Blue, Sweet Yellow, Sweet White, and Bitter Blue lupins growing in sterile soil in the glasshouse showed that all except Sweet Yellow were highly susceptible, repeated inoculations of the last-named failing to cause infection.

Phytophthora infestans caused severe losses of potatoes throughout South Island during the autumn of 1945, following an abnormally wet summer. A survey of a limited area including 60 separate potato crops showed that among maincrop varieties Dakota was the least affected by tuber decay; Arran Banner had up to 80 per cent. tuber loss. The heavier and damp loams were associated with more disease than sandy loams and it appears that soil moisture retention following initial saturation is a primary factor. Among the varieties Aucklander S. T., Arran Banner, and Dakota, infections were less severe when the crop followed lupins used as green manure, the favourable effect being attributed to the resultant open texture and quick drainage conferred, and most severe when potatoes were grown for the second time in succession.

An investigation is being undertaken into 'scab' of maturing wheat. Isolations of fungi from ears collected in the field have provided spore suspensions for glasshouse and field inoculations which have indicated that at least six distinct types of *Fusarium* can cause ear blight to the extent of producing complete sterility. For comparisons between ear-blight symptoms in the field and apparent frost injury, potted plants were transferred to a refrigerator at anther extrusion. Those maintained at 32° C. for seven hours showed no abnormality at maturity. Those kept at 30° for two hours showed 60 per cent. normal spikelets, the others having sterile or shrivelled grain. Two hours' exposure to 26° caused 80 per cent. of the spikelets to show frost injury, mostly complete sterility. Symptoms identical with those found in frosted fields were observed in the experimentally frosted ears. It appears that frost at flowering may possibly cause distinct 'ear blight' of a physiological type. There would seem to be little difficulty in distinguishing between ear blight due to frost and that supposedly due to fungal infection. The 'whitehead' condition, very common in 1945–6, is a phase of 'ear blight'. The 'straggle' phase of *Cercosporella* [? *herpotrichoides*: ibid., xxiv, p. 493] injury leading to 'whiteheads' was observed in three localities, in two of which the organism was isolated. 'Whitehead' associated with late attacks of *Ophiobolus graminis* affected several wheat crops very severely, and traces of the disease were widespread; it was prevalent in crops sown after grass [cf. ibid., xxiii, pp. 130, 338; xxiv, p. 180].

Field evidence suggested that wheat seedling root rots are of three types, lesions on the sub-crown internode due to *Rhizoctonia* [*Corticium*] *solani* and *Fusarium* spp., root-tip decay due to *O. graminis*, and seedling blight due to secondary infections by *F.* spp.

Annual Report, Cawthron Institute, Nelson, New Zealand, 1945–6.—39 pp. [1946].

This report [cf. *R.A.M.*, xxv, p. 26] contains, in addition to the records already reviewed [see preceding abstract], the following results of investigations in progress. Further glasshouse tests of different treatments on the increase of 'cloud' in Dreadnought tomato plants are reported in the section on tomato investigations (pp. 20–24) to have been inconclusive because of the low incidence (3·8 per cent. compared with 14·1 in 1944), attributed to the drier condition of the soil in the early part of the season. The results appear, however, to confirm those of previous years in regard to an increase of the trouble with heavy watering of the plants, steam treatment of the soil, and the use of fertilizers.

In experiments designed to test the effect of fertilizers and soil disinfection on the incidence of tobacco mosaic (pp. 27–28) it was found that steam, urea, chloropicrin, formalin, and D.D. treatments of the seedling beds reduced the initial amount of disease in the field in comparison with untreated seedlings. Considerable increase of mosaic in the field was associated with applications to the seedling beds composed of unsteamed soil of fertilizer in excess of 0·5 lb. per sq. yd. and with pricked-out seedlings in comparison with those sown direct in the bed.

In contrast to the preceding season, angular leaf spot (*Pseudomonas angulata*) was either completely absent or very slight throughout all the tobacco-growing districts, presumably owing to the drought which persisted through the latter half of January and the whole of February.

RAYNER (R. W.) & NATTRASS (R. M.). **Annual Reports of the Plant Physiologist and Pathologist (Coffee Services) and the Senior Plant Pathologist, 1945.**—*Rep. Dep. Agric. Kenya, 1945*, pp. 55–61, 85–90, 1946.

In this report [cf. *R.A.M.*, xix, pp. 71–76] it is stated that in April, 1945, severe shedding of coffee cherries in all stages of development was noted on the Mongalia estate, Mitubiri, Kenya. Cherries reaching maturity often contained blackened beans showing no external lesion and from which no organism could be isolated. The condition appeared to be of physiological origin, similar to, but much more severe than, the shedding of young coffee cherries prevalent in the Makuyu area. Both this latter type of shedding and the production of black beans are due to insufficiency of carbohydrates but developing earlier than that which induces over-bearing die-back.

A new type of physiological die-back, found at the Mchana estate, Ruiru, started as a vein-crossing scorch in which eventually all the leaves of a branch became involved and the branch died back. Such branches occurred mainly in the outer and upper regions. The affected trees were mostly found in a large, elongated depression, the centre of which was 20 ft. below the lowest point on the periphery. Drought extending over a considerable period, associated with mineral deficiency, is thought to have caused the die-back.

A peculiar drooping of the leaves on multiple stem coffee at Gethumbwini Estate, Thika, not caused by wilt, was associated with very short internodes on the main stem. The droop was fairly general on old, rather isolated, multiple stem heads, and was absent when these were shaded from the afternoon sun. It is thought to be a peculiar growth form induced by abnormal exposure.

Further study of pyrethrum [*Chrysanthemum cinerariifolium*] wilt and crown rot supported the view that much of the trouble is due to drought, over-cropping, or faulty cultivation. The disease often appears to start from a snag of dead wood left on the split [plants]. Other factors conducive to the condition are water-logging, bad planting, damage by implements, and localized unsuitability of the soil. Associated with the rot are two constantly recurring types of *Fusarium*, *Sclerotinia minor*, and, less often, *S. sclerotiorum*. When either surface-sterilized pyrethrum seed or splits were grown in a mixture of sterile soil and sclerotial material from a pure culture of *S. minor* no infection had appeared after four months, and the sclerotia showed no sign of renewed growth. When a lettuce leaf infected with *S. minor* was placed at the base of pyrethrum seedlings 12 to 15 cm. high, rapid infection occurred after the plants had been covered with a bell jar for two days, killing the apical leaves in two to three days; two months later, some of the infected plants recovered and put out fresh shoots. Partial recovery had been observed occasionally in the field. Young seedlings were readily infected by placing small pieces of a ten-day agar culture in the leaf axils. The following plants (in descending order of susceptibility) were infected by inoculation: lettuce, lemon fruits, carrot, and beetroot. The evidence indicated that some of the forms producing large sclerotia on pyrethrum in the field and attributed to *S. sclerotiorum* may belong to *S. minor*.

Phoma lingam, not before recorded from Kenya, caused heavy loss to *Brassica* spp. being grown under the Government seed-production scheme. A crown rot of lucerne was caused by a fungus resembling *Rosellinia necatrix* in the cultural characters of the mycelium. A canker disease of tea affecting large areas of the main branch system occurred in several blocks on a large estate. The condition

was associated with a species of *Pestalotia* other than *P. theae* and with a *Phomopsis*, inoculations with both of which gave negative results. Ingress appeared to have taken place through pruning wounds; heavy pruning, followed by sun scorch, is thought to have been the primary contributing factor. Piling up the prunings to protect the bushes from the sun prevented damage to blocks pruned later.

Potato blight (*Phytophthora infestans*) [ibid., xxi, p. 426; xxiv, p. 337] is now permanently established in East Africa. The disease has occurred every season since 1941 throughout Kenya. Two resistant native varieties are being multiplied for 'seed', and the resistant Skerry Blue variety from Uganda [ibid., xxv, p. 27] is also being multiplied and distributed. In breeding work against the disease, plants from true seed of *Solanum demissum* received from Professor Reddick of Cornell University were raised for testing with the local biotypes of the fungus. Tubers of these plants were dispatched to Uganda, the Belgian Congo, and remote parts of Kenya, and no reports of blight were received; laboratory tests confirmed the immunity. A collection of later hybrids, including the new Empire variety [ibid., xxv, p. 276], were received from the same source. As it is now admitted that potatoes suitable for growing in the tropics need not necessarily be produced there, these and other temperate varieties will be grown and further breeding discontinued. There appears to be no evidence so far that the blight biotypes present in Kenya differ from those found in the United Kingdom, in fact only two seem to be present. The local varieties known as Kinongo and Kerai have been identified as Northern Star.

Further study of potato virus diseases in Kenya showed that all viruses investigated are types that have also been found in the United Kingdom. All the chief symptoms are manifestations of leaf roll, X, and Y and their combinations, virus Y, apparently, being responsible for most of the severe virus symptoms found. There is no question of any general degeneration of stocks, though some have been in cultivation for many years. Freedom from virus infection of individual Kinongo plants may perhaps be due to occasional setting of fruits and the consequent production of virus-free seedlings not differing essentially from the variety.

ORIAN (G.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1945*, pp. 13–15, 1946.

In this report [cf. *R.A.M.*, xxv, pp. 204, 253] it is stated that red rot [*Physalospora tucumanensis*: ibid., xxv, p. 233; xxvi, p. 126] was again widespread on the sugar-cane variety M. 134/32 during 1945 in Mauritius. In a large proportion of the attacks, infection was not correlated with insect damage to the stem. These observations and the fact that disease was commonly observed to have progressed through several internodes from individual infection sites indicate that M. 134/32 has again shown higher susceptibility than before.

The investigations on bud rot of royal palm (*Roystonea regia*) due to *Xanthomonas vasculorum* [ibid., xxiv, p. 368] were concluded. The presence of the disease is shown by the slow drying-out of the leaves from the oldest inwards, but occasionally some green leaves are found near the middle of the crown when the youngest emerging leaf begins to dry out. In advanced cases, the terminal bud and growing point tissues collapse into a malodorous mass. The vascular bundles of the stem, leaf, sheaths, and leaf stalks when cut across exude yellow gum, cavities filled with which are often found in the tender tissues of the top. No case of recovery is known. The causal organism was reinoculated successfully into royal palm and cross-inoculated into the white palm (*Dictyosperma album*). A plot of *D. album* and *D. rubrum* laid out in 1937 showed in June, 1945, 19 of 26 of the former and 1 of 8 of the latter affected by leaf blight due to *X. vasculorum*. The disease had not previously been observed in the plot, which was bordered with the highly susceptible M. 55/1182 sugar-cane variety.

Owing to the presence elsewhere of a virus disease of sweet potato [cf. ibid., xxvi, p. 145], the importation of living parts of this plant is forbidden.

STEYAERT (R. L.). **Plant protection in the Belgian Congo.**—*Sci. Mon., N.Y.*, lxiii, pp. 268–280, 7 figs., 1946.

In the part of this paper dealing with plant disease problems in the Belgian Congo the author states that efforts are being continued to select strains of cotton resistant to *Nematospora coryli* [*R.A.M.*, xxv, p. 28, 154] and *Ashbya* [*N.*] *gossypii* [ibid., xviii, p. 797]. Artificial inoculations have shown marked differences in the reactions of various strains on the bolls. Since *Fusarium vasinfectum* was found on cotton at Bambesa in 1937 [ibid., xxv, p. 28], many foci of infection have been discovered, chiefly in the eastern part of the Uele district, northern Sankuru, and western Ubangi; in most cases the primary infections have been traced to Wonder Dixie Triumph seeds imported from the United States. To retard spread, strict quarantine measures have been enforced on the propagation of seed within the Colony. Selection for resistance, begun in 1939, is progressing satisfactorily. A crystalline product was isolated from the fungus, which reproduced the symptoms of the disease. Wilt is a serious threat locally, as most of the soils are of light texture and have a pH under 7. In addition, climatic conditions and soil temperatures near or within the optimum for the growth of the fungus are present throughout the year.

The chief disease of oil palm is caused by *Ganoderma lucidum* [cf. ibid., xvii, p. 314], which attacks the roots and trunk. Spike diseases (*Fusarium* spp. and *Pestalotia* spp.) are common and some are of major importance. *Armillaria mellea* was recorded on the roots and trunks recently, while deficiency diseases, indicated by leaf chlorosis, require much attention.

The new plantations of *Hevea* rubber show an alarming incidence of root rots, of which the chief is *Fomes lignosus* [ibid., xxv, p. 358], the African strain of which appears to be much more virulent than any of the Asiatic strains, its pathogenicity also being enhanced by the favourable environmental conditions.

Attempts to control the robusta coffee pest *Stephanoderes hampei* by spraying with spore suspensions of *Beauveria bassiana* [ibid., x, p. 188] (natural infections with which considerably reduce the insect population) gave inadequate results. The fungus is highly virulent to insects feeding on unripe coffee berries, especially during the cloudy weather prevailing north of the equator in June and July. Infection usually develops after the insect has bored a gallery to the middle of the berry. It then stops feeding, and crawls backwards until its abdomen protrudes, when there develops from it a puff of white mycelium bearing thousands of spores scarcely 3μ in diameter.

On the whole, coffee is little affected by fungal diseases in the Belgian Congo, though white root rot [*F. lignosus*: ibid., xix, p. 329] is sometimes troublesome in places. Round Lake Tumba coffee roots are often attacked by *Pseudococcus citri*. The insect does not appear to be dangerous unless *Polyporus coffeae* [cf. ibid., xxi, p. 287] develops on the exudate, when the insect lives in cells made of the mycelium. The fungus forms a brown sheath round the roots, but can be killed off by exposing the infected roots to the sun for five days. *Hemileia* rust [*H. vastatrix*: ibid., xxiv, p. 8] is virtually non-existent on robusta coffee, and when present is more an indication of an unhealthy condition of the trees than of true parasitism. Cacao root rot due to *Armillaria* [*mellea*: ibid., xiv, p. 87; xv, p. 16] is important, the fungus causing the well-known collar-crack.

By the end of 1942, potato blight (*Phytophthora infestans*) [ibid., xxii, p. 325] had gained a foothold in the Belgian Congo. In 1943, it extended its ravage over the whole of Ruanda–Urundi, Kivu, and Ituri, and spread, with disastrous results, to

the native-grown crops, which had become widely cultivated. It is estimated that in 1943, 200,000 tons of the potato crop were lost in Ruanda-Urundi alone. As the conditions in tropical highlands strongly favour infection, the disease is very difficult to control. Spraying is only of limited application on native farms, and the only means of control appears to be the use of resistant varieties [see above, p. 234].

The chief maize diseases are streak [loc. cit.], which occurs in the highlands, and *Sclerospora maydis* [loc. cit.], which is found in the lowlands. The latter has recently been prevalent in the Sankuru area, and selection work for resistance is in progress.

Wheat is grown only in the highlands, and is everywhere affected by *Puccinia graminis* though the barberry does not grow in Africa. Two crops are grown every year and stubble and ratoons carry the disease over from one crop to the next. Seed of resistant varieties has been imported from East and South Africa for breeding purposes.

Rice, cultivated in the hotter parts of the Belgian Congo, is sometimes attacked by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*].

Groundnuts, cultivated more as a delicacy than as a staple food, are sometimes badly attacked by rosette [loc. cit.]. The only cassava disease of economic importance is mosaic [ibid., xvii, p. 791], transmitted by *Bemisia gossypiperda* var. *mosaicivecta* [ibid., xviii, p. 231]. Among the many cassava varieties grown locally, it should be possible to find resistant ones. Sweet potatoes were found to be affected by a sort of rosette disease in the Ituri in 1939, the condition being suspected to be due to a virus [cf. ibid., xxv, pp. 28, 154, and preceding abstract].

Boughey (A. S.). **A preliminary list of plant diseases in the Anglo-Egyptian Sudan.** —*Mycol. Pap. Imp. Mycol. Inst.* 14, 16 pp., 1 map, 1946. 3*s*. net.

This preliminary list of diseases of economic plants in the Anglo-Egyptian Sudan [*R.A.M.*, xxii, p. 11] is compiled from the records of the Department of Agriculture and Forests and from various published works. The hosts are arranged alphabetically under their English names, the diseases of each being listed with English names and Latin binomials. That the list may have additional ecological value the regional distribution of diseases has been shown by dividing the Sudan into its former 15 provinces. Each district represents a fairly uniform combination of climatic and edaphic factors. The presence and frequency or the absence (if the host is present but the disease is not) of a disease in a given district is indicated.

Verona (O.). **Nutrizione e virulenza in 'Bac. tumefaciens'.** [Nutrition and virulence in *Bacterium tumefaciens*.]—Reprinted from *Riv. Pat. veg.*, xxxii, 9–10, 7 pp., 1942. [Received March, 1947.]

Continuing his researches on *Bacterium tumefaciens* [cf. *R.A.M.*, xviii, p. 729 and next abstracts] the author used a strain which had been grown on agarized meat broth (1·5 per cent.) for culturing on each of the following media, transferring each six times at intervals of a fortnight: (1) Berthelot's medium [ibid., ix, p. 767], (2) agarized meat broth (1·5 per cent.), (3) peptone agar (1·5 per cent.), (4) asparagin agar (1–1·5), (5) peptone-glucose agar (15–2–1·5), (6) glucose agar (2–1·5), (7) glycerine agar (2–1·5), and (8) starch agar (2–1·5). After the sixth transfer growth on these media was, respectively, very abundant, very abundant, abundant, very sparse (lost at the third transfer), good, very sparse, rather sparse, and very sparse. In addition, there were also differences in the morphological characters of the colonies on the different media; the organisms were less mobile on some than on others and were irregular also in size and shape.

All the strains (except that grown on substrate 4) were used to inoculate *Ricinus* [*communis*] seedlings in pots. The average dry ash weights of the resulting tumours induced by the seven strains used were, respectively, 0·1656, 0·1053, 0·0358, 0·0559, 0·0252, 0·0435, and 0·221 gm. The smooth colonies were again found to be more virulent than the rough [ibid., xxv, p. 546].

VERONA (O.). **Azione repressiva sullo sviluppo dei tumori dovuti a Bact. tumefaciens dallo zolfo somministrato al terreno.** [The repressive effect on the development of tumours due to *Bacterium tumefaciens* of sulphur applied to the soil.]—Reprinted from *Ann. Fac. agr. Pisa*, N.S., vi, 7 pp., 1 pl., 1945. [Received March, 1947.]

When *Ricinus* [*communis*] plants, 20 cm. high, grown in boxes of sand or garden soil, to some of which powdered sulphur had been added at the rate of 1 or 2 gm. per kg., were inoculated with a young virulent culture of *Bacterium tumefaciens* [see preceding and next abstracts] (all the inoculations being successful), the resultant galls, at the seeding stage, were conspicuously smaller on the plants grown in the sulphur-treated soil or sand than on the others. The effect was most marked on the plants in soil plus sulphur. As it was thought that this retardation might be associated with change of the sulphur into sulphates in the soil a further experiment was carried out. To nine pots each containing 2 kg. sand, one being left untreated, additions were made, respectively, of calcium sulphate, potassium sulphate, sodium sulphate, magnesium sulphate (each of the foregoing with addition of ammonium nitrate), calcium nitrate, potassium nitrate, sodium nitrate, and magnesium nitrate. In each of the sulphate pots the quantity of sulphur present amounted to 0·32 gm., while the nitrogen content equalled that in the nitrate pots; in the latter series the weights of the metals present corresponded to those of the sulphate series. Except for the calcium sulphate, the salts were dissolved in 120 c.c. distilled water and added at the rate of 40 c.c. per day from the tenth day after sowing [*Ricinus*]. The plants were then inoculated. All the inoculations produced infection and in 12 to 15 days differences in the sizes of the galls became noticeable. An additional single application of the salts was then made in the same quantity as before. On the 45th day the galls were removed and the dry weights averaged, respectively, for the nine pots, 0·492 (control), 0·335, 0·422, 0·225, 0·43, 0·438, 0·43, 0·58, and 0·417 gm., the corresponding figures for sulphur as a percentage of the dry weight being a trace, 0·192, 0·148, 0·151, 0·143, and for the last four 0·039. These figures clearly show that the sulphates had a markedly repressive effect on the growth of the galls, and that this effect was specifically associated with the sulphate ion, which had been absorbed, and not with the cation [cf. preceding and next abstracts].

FLORENZANO (G.). **Effect of nitrogenous fertilizers on galls caused on Castor-Oil plants by Bacterium tumefaciens.**—*Int. Bull. Pl. Prot.*, xx, 11–12, pp. 97 M–101 M, 3 figs., 1946.

Continuing the researches initiated by Verona on the relation of mineral salts to the development of crown-gall (*Bacterium tumefaciens*) tumours in castor oil (*Ricinus communis*) plants [see preceding abstracts], the writer in 1942 and 1944 added to pots of (*a*) sandy, (*b*) clay soil, and (*c*) mould, (1) decomposed manure (600 quintals [1 quintal = 100 kg.] per ha.), (2) potassium nitrate (2 qls.), calcium cyanamide (4 qls.), and ammonium sulphate (6 qls.). The galls were uniformly larger on the plants in the sandy soil than on those grown in mould or clay. The effects of the fertilizers on the size of the excrescences varied with the soil type: in mould their action was definitely unfavourable, while in sand and clay they slightly reduced the extent of the tumours as compared with the controls receiving no amendments, except for calcium cyanamide, which increased gall diameter.

GAUTHERET (R. J.). **Comparaison entre l'action de l'acide indole-acétique et celle du Phytomonas tumefaciens sur la croissance des tissus végétaux.** [Comparison between the action of indole-acetic acid and that of *Phytomonas tumefaciens* on the growth of plant tissues.]—*C.R. Soc. Biol., Paris*, cxl, 5–6, pp. 169–171, 1946.

The author showed in previous experiments (*Bull. Soc. Chim. biol.*, xxiv, p. 13, 1942) that carrot tissues grown in a medium containing 0·1 mg. indole-acetic acid [cf. *R.A.M.*, xix, p. 467] per l. gradually lost their sensitivity to heteroauxin, and further (Une voie nouvelle en biologie végétale: la culture des tissus. Gallimard, Paris, 1945) that the periphery, and sometimes the entire mass of such colonies was composed of minute, quasi-discrete nodules in contrast to the normally smooth surface. An anatomical study of the tissues in question revealed a parenchymatous mass with only a few scattered cribrovascular elements of anomalous appearance. Other accompaniments of acclimatization to heteroauxin were a loss of the rhizogenous capacity of normal tissue and a faculty for rapid proliferation persisting even in the absence of indole-acetic acid from the medium.

Attention is drawn to the analogies between these features and those observed by White and Braun in their culture of sunflower crown-gall (*Phytomonas* [*Bacterium*] *tumefaciens*) tissues [*R.A.M.*, xxi, p. 6].

HILDEBRANDT (A. C.), RIKER (A. J.), & DUGGAR (B. M.). **Influence of crown-gall bacterial products, crown-gall tissue extracts, and yeast extract on growth in vitro of excised Tobacco and Sunflower tissue.**—*Cancer Res.*, vi, 7, pp. 368–377, 2 graphs, 1946.

In studies at the University of Wisconsin on the effect of certain crown-gall (*Phytomonas* [*Bacterium*] *tumefaciens*) metabolites and tissue extracts and yeast extract on the growth *in vitro* of the callus tissues of Giant Russian sunflower and tobacco (*Nicotiana glauca* × *N. langsdorffii*) fermented, bacteria-free media from virulent and attenuated cultures of the pathogen added to the basic medium exerted a strongly inhibitory effect at the higher concentrations of 2, 4, and 8 ml. per 50 ml. Lyophilized virulent and attenuated bacterial cells were also generally injurious to the development of both tissues at concentrations of 0·012 to 0·2 gm. per 50 ml. The addition to the basic medium of autoclaved marigold [*Tagetes* (?) *patula*: cf. *R.A.M.*, xxi, p. 247] crown-gall tissue extract, of unautoclaved tomato gall extract, and of unautoclaved brewer's yeast extract usually stimulated the growth of the excised tobacco and sunflower tissues at lower concentrations in a range from 0·125 to 8 ml. per 50 ml. but inhibited it at higher ones. Autoclaved Paris daisy [*Chrysanthemum frutescens*] crown-gall tissue extract at all concentrations promoted the growth of sunflower tissue, but tended to depress that of tobacco at the higher dosages.

KRYTHE (J. M.) & WELLENSIEK (S. J.). **Five years of colchicine research.**—*Bibliogr. genet.*, xiv, 1, pp. 1–132, 1942. [Received April, 1946.]

An attempt has been made to summarize the recent literature on colchicin, with special reference to the induction of polyploidy in plants, e.g., in the case of crown gall (*Bacterium tumefaciens*) tumours [*R.A.M.*, xxi, p. 247]. The bibliography comprises 385 titles.

STAHEL (G.). **Cacao.**—*Meded. Dep. LandbProefsta. Suriname*, 10, 32 pp., 1947. [Dutch.]

The section of this bulletin dealing with cacao diseases and pests in Surinam contains notes on witches' broom [*Marasmius perniciosus*: *R.A.M.*, xiv, p. 430] and stem canker and fruit rot [*Phytophthora palmivora*: ibid., viii, p. 527]. The most profitable method of combating the former is the removal and destruction of

the brooms at least four times a year, while the stem cankers should be excised and the wound treated with a disinfectant. Spraying the fruits with Bordeaux mixture is effective but too costly for the small grower.

CHESTER (K. S.). **The nature and prevention of the cereal rusts as exemplified in the leaf rust of Wheat.**—xvi+269 pp., 1 fig., 2 diags., 8 graphs, 1 map, Chronica Botanica Company, Waltham, Mass., 1946. $5·00.

This important book deals primarily with leaf [brown] rust of wheat, *Puccinia triticina*. It gives an extensive synopsis of the literature, which is particularly useful because the Russian papers have been read in the original (full translations of most of them have been made and deposited in three libraries in the United States and one in Canada).

The 15 chapters deal with the history of the disease; the origin, distribution, and economic importance; effect on the host; suscepts; symptomatology; etiology; physiologic specialization (two chapters); factors affecting rust survival and development (two chapters); dissemination, annual cycles, and epiphytotics; natural, regulatory, and cultural rust control; rust control by the use of fungicides; and control by rust resistance (two chapters). The bibliography includes nearly 500 titles, and is followed by an author index and a full general index.

The only alternate host of *P. triticina* found infected naturally is *Isopyrum fumarioides*, a perennial weed which is very commonly heavily infected in the Lake Baikal region of the U.S.S.R. This suggests that central Asia is the point of origin of the rust. The writer prefers the generally used narrow concept of *P. triticina* rather than that which places the rust as a form of *P. rubigo-vera* or of *P. elymi*.

Most or all of the 129 'registered' physiologic races can, it is thought, be placed in eleven 'race-groups'. The whole field of physiologic specialization in *P. triticina* is considered comprehensively, as are the other phases of the subject. The book is clearly and readably written, and will be of value to all plant pathologists.

MILNER (M.), CHRISTENSEN (C. M.), & GEDDES (W. F.). **Grain storage studies. V. Chemical and microbiological studies on 'sick' Wheat.**—*Cereal Chem.*, xxiv, 1, pp. 23–38, 3 figs., 1947.

'Sick' or germ-damaged wheat samples from Montana, North and South Dakota, and Minnesota showed 76 per cent. mould infection and very low germination values (1·4 per cent. average of 12, compared with 86·7 for sound material) on examination at the Minnesota State Seed Testing Laboratory. The most prevalent mould on the 'sick' seeds was *Aspergillus glaucus* (60 per cent.), followed by *Penicillium* sp. (20 per cent.), the remaining 20 per cent. being composed of *A. niger*, *A. flavus*, *A. candidus*, *Nigrospora*, *Rhizopus*, and *Trichoderma* spp., and several unidentified bacteria [*R.A.M.*, xvi, p. 664; cf. also xxii, p. 350]. The sound samples from the same lots were largely contaminated by *Alternaria* sp. (90 per cent.), which disappeared in storage under moisture conditions favouring the growth of species of *Aspergillus*. *Fusarium* and *Helminthosporium* spp. were present to the extent of 5 per cent. each.

Surface-disinfected, relatively mould-free Montana wheat, inoculated with various moulds isolated from 'sick' seeds and stored in air, lost viability more rapidly than did the controls, and most of the non-viable seeds showed the dark germ typical of the condition. For instance, after 38 days the percentage of germination among the controls and inoculated seed ranged from 90 to 93 and 34 to 74 per cent., respectively, the corresponding figures at the end of 111 days being 49 to 67 and 14 to 35, respectively. Moulds were present on the controls before the completion of the test, and none of the samples germinated after 201 days.

'Sick' wheat was produced in the laboratory by storing samples of the Regent variety at 18 per cent. water content under atmospheres of carbon dioxide, nitrogen,

or oxygen in sealed containers. Only under oxygen did moulds, principally *Aspergillus glaucus* and *A. candidus*, proliferate throughout the test period of six months, whereas 'sick' kernels appeared under all atmospheres. Fat acidity increased in all samples at 18 per cent. moisture, reaching a maximum in the oxygen series. The 'sickness', therefore, could not be attributed exclusively to moulds, but was enhanced by their metabolic activity. Aerobic and anaerobic production of carbon dioxide by moulds and seeds under the experimental conditions necessitated monthly renewals of the oxygen and nitrogen atmospheres. Fat acidity of mill fractions of sound wheat was at a maximum in the bran fraction, decreasing regularly towards the patent flour, whereas in the 'sick' material the low-grade flour showed the highest fat acidity. These effects are apparently due to the high lipase activity of the aleurone layer and scutellum in relation to that of the germ.

KLYKOV (A. P.). О сохранении жизнеспособности возбудителя черного бактериоза в семенах пшеницы. [The viability of the causal agent of black bacteriosis in Wheat seed.]—*Микробиология [Microbiology]*, xiv, 6, pp. 413–414, 1945. [Received April, 1946.]

In these experiments to test the viability of the causal organism of black bacteriosis (*Bacterium [Xanthomonas] translucens*) in wheat, seed of 10 varieties was washed in running water and then disinfected with mercuric chloride to eliminate external infection. Portions of 1 gm. of the disinfected seed were ground with sterile water in a mortar and the resultant suspensions, when sown on agar, produced colonies which showed that each gm. of grain of one variety had 12,620,000 bacteria present at the start of the experiment, 870,000 at the end of six months, and only 1,000 by the end of three years. Another variety, which carried 760,000 bacteria to begin with, falling to 181,000 in six months, still carried 4,000 at the end of three years; while in six other varieties infection varying initially from 3,240,000 to 760,000 per gm. dropped to nil by the end of the three-year period.

ÅKERMAN (Å.). **Nya iakttagelser rörande olika Havresorters motståndskraft mot gråfläcksjuka.** [New observations relating to the resistance of different Oat varieties to grey speck disease.]—*Sverig. Utsädesfören Tidskr.*, lvi, 2, pp. 159–172, 1 fig., 1946. [English summary.]

In the light of the cumulative data obtained in trials on the reactions of a number of oat varieties to grey speck [manganese deficiency], which have been carried on intermittently at the Swedish Seed Association Station since 1921 [*R.A.M.*, i, p. 417; xii, p. 19], the following approximate grouping is proposed: I a (very susceptible): Förädlad Dala, certain selections of *Avena orientalis*, Vit Odal, and v. Lochows Gelbhafer; I b (fairly susceptible): Guldregn I, Örn, Bambu, Seger, Orion I, Eko, Gul Naesgaards, Primus, Sol I, Guldregn II, Thors, and Ligowo II; II a (fairly resistant): Engelbrekt II, Gopher, Argus, Engelbrekt I, Klock II, Klock III, Stjärn, Diamant, Sølv, Orion II, Perle, Melöj III, Extra Klock, Stormogul I, Stormogul II, Sirius, and Klock I; II b (very resistant): Mesdog, Moss, Fyris, and *A. strigosa* [cf. ibid., xxvi, p. 195]. It would appear from these observations that the Swedish white oats are generally more susceptible to the disease than the black types from the central and northern regions, while continuous selection seems almost invariably to have led to enhanced resistance.

Wide discrepancies in segregation among the progeny of crosses have been recorded, involving transgressions both in susceptibility and resistance to manganese deficiency. It is concluded that breeding for resistance is feasible, but owing to the complex nature of the mode of inheritance a lengthy period is likely to be required for the development of varieties adapted to the varying local requirements of the country. In the meantime steps should be taken to combat the trouble by soil amendments with manganese sulphate [ibid., xxiv, p. 431].

JOSEPHSON (L. M.) & JOHNSON (E. M.). **Crazy top of Corn in Kentucky.**—*Plant Dis. Reptr*, xxxi, 2, pp. 69–70, 1947. [Mimeographed.]

During 1946, U.S. 13 hybrid maize in Greenup County, Kentucky, developed a striking abnormality similar to crazy top [*R.A.M.*, xxv, 556]. In most cases the floral organs became entirely replaced by vegetative shoots, a large, bunchy vegetative growth appearing instead of the tassel, with twisting and curling of the leaves immediately below. On these plants ear primordia were lacking but on some plants there were a few normal male florets. Sometimes there was much branching from the leafy proliferations of the tassel with vegetative shoots developing at the terminal ends of these branches which were entirely of leaf tissue. One plant was discovered with a normal ear and tassel; except that a large, bunchy, vegetative growth had developed from one sprig of the tassel. Several plants showed ears consisting entirely of leaf tissue and male florets; some produced apparently viable pollen. Others showed excessive jointing on the upper half of the stalk with no bunch at the top. A few were not over 2 ft. tall and were excessively branched. Leafy shoots of the witches' broom type arose from the terminal meristems of the branches and floral organs.

While the cause of the condition has not yet been ascertained, the witches' broom type of growth suggests a virus origin. The field was subject to flooding, but no definite connexion between this and the disease has so far been traced.

HAAS (A. R. C.) & ZENTMYER (G. A.). **Treatments for chlorosis in Lemon leaves.**—*Calif. Citrogr.*, xxxii, 2, pp. 48–49, 64–65, 8 figs., 1946.

In further studies on the effects of various iron compounds on the control of chlorosis in lemon leaves [cf. *R.A.M.*, xxvi, p. 102] carried out at the Citrus Experiment Station, Riverside, California, treatments were given in July, and the shoots examined on 30th August, 1946. A dust treatment with 8 gm. fermate, 8 gm. magnetite, 1 gm. ferrous sulphate, 1 gm. sulphur plus 1 gm. dextrin resulted in the leaves becoming fully green. A dusting (on 1st May), using 4 gm. magnetite, 1 gm. sulphur, caused a considerable though gradual improvement. Leaf dips, using 1 gm. iron sulphate in 1 l. distilled water, or the following combinations: 1 gm. iron sulphate, 0·25 gm. dextrin, 5 c.c. glycerine; 1·2 gm. iron sulphate, 1·2 gm. dextrin, 1·2 gm. sulphur; 1 gm. iron sulphate, 0·25 gm. sulphur, 5 gm. molasses; or 0·25 gm. iron citrate, 0·25 gm. sulphur, 0·25 gm. dextrin, 1 c.c. glycerine, all with blood albumen spreader in 1 l. distilled water, all gave good colour improvement.

A progress report on quick decline studies.—*Calif. Citrogr.*, xxxi, 6, pp. 198–199, 207, 210–215, 1 fig., 1946.

In this account of the investigations into quick decline of orange trees [*R.A.M.*, xxv, p. 498] H. S. FAWCETT points out that agencies other than that producing quick decline may cause loss of starch in roots and that care is necessary to eliminate the possibility of such factors before attributing the starch loss to quick decline.

H. SCHNEIDER's histological investigations revealed a collapse of the sieve-tubes in the region of the bud union in trees known to be in the early stages of quick decline. In the later stages a gradual degeneration of the tubes in the outer portion of the functioning phloem spread as far as 18 in. above and below the union, accompanied by considerable necrosis at the union at all stages. It is suggested that a substance passes from the leaves to the roots. The general result is to leave the roots defenceless against fungal and bacterial attack. These histological symptoms are said to resemble closely those caused by Green Valley buckskin [peach X-disease] virus infection of *Prunus avium* on Mahaleb (*P. mahaleb*) roots [ibid., xxv, p. 37].

Two common species of brown-rot fungi [*Phytophthora citrophthora* and *P. parasitica*] were frequently isolated from rotting roots by L. J. Klotz and G. A. Zentmyer. *Fusarium* sp. and *Pythium ultimum* were present also, and many species of bacteria. The two brown-rot fungi were found capable of destroying feeder roots at various temperatures between 50° and 86° F. and at a moisture content of field capacity, root destruction being higher in colder, wetter soils. Citrus seedlings grown in vaporized nutrient in 10-l. glass jars and thus kept thoroughly wet and aerated were also quickly destroyed, a result suggesting that in the orchard lethal fungal attack of the roots might follow waterlogging, as better aeration was established. Inoculations of the roots of apparently healthy trees in quick-decline groves with the various fungi isolated suggests that their pathogenicity in these circumstances is unimportant.

Iron sulphate and fuller's earth alone among many soil treatments applied stimulated root growth in affected trees. Hormone treatment of the rootstocks and trunks of some of the experimental trees produced in several cases a definite, if temporary, improvement.

J. M. Wallace and G. A. Zentmyer found that cut roots with little or no starch content rotted easily, whereas those which had reached the equilibrium stage and had replenished their starch did not decay when cut.

Fawcett (H. S.) & Wallace (J. M.). **Evidence of the virus nature of Citrus quick decline.**—*Calif. Citrogr.*, xxxii, 2, pp. 50, 88–89, 1 fig., 1946.

Near Covina, California, in April, 1945, several one-year-old Valencia orange trees on sour orange stocks were planted and in June buds from old Valencia trees suffering from quick decline [see preceding abstract] were placed in 100 of these healthy trees. Similar 'spur' buds from healthy Valencia trees growing outside the quick decline area at Riverside were placed in 50 of the young Valencia trees at Covina, 50 similar trees being left unbudded. Of the old infected Valencia trees 45 per cent. showed symptoms of quick decline in May, 1945. In August, 1945, it was found that approximately the same number of buds from healthy as from affected trees became well-established in the young trees. During September, 1946, some of the young trees began to show top symptoms suggesting quick decline and these also had low starch content in the roots. By November, 1946, of those grafted with affected buds 36 had contracted the disease as against one of those budded with healthy buds and one amongst the 50 not budded.

Bartholomew (E. T.) & Sinclair (W. B.). **Bud selection and granulation.**—*Calif. Citrogr.*, xxxii, 3, pp. 94–106, 123–4, 1 fig., 1947.

Granulation [*R.A.M.*, xxiv, p. 97] is of commercial importance only in the Valencia orange in California. It can only be located by cutting the fruit, as it is a disorder of the juice sacs where chemical changes result in the formation of more inorganic matter and less sugar and carotin than in healthy sacs, thus adversely affecting the flavour. It occurs most commonly on young trees, particularly in the latter half of the picking season, and in the largest fruits; the trees tend to behave consistently from year to year. It is increased by low temperatures, excessive irrigation, and conditions favouring rapid tree growth, so that fertilizers may cause an increase. Irregularity of occurrence indicates that granulation is affected by many factors. As a method of control, lime spraying has proved effective, but this method results in premature loss of leaves.

An attempt was made by the authors to secure control by selection of buds and rootstocks. Buds were selected from four trees at Santa Ana and two at Riverside. Three of the trees had a history of heavy granulation, and three of little. Buds from each tree were set in equal numbers on sweet and sour orange stocks. The resulting 140 trees were grown together and subjected to the usual grove treatment.

The results show that in most cases the origins of buds and stocks made little difference to the percentage granulation, which averaged for the five years, 1941–6, 26 to 28 per cent. at Santa Ana. At Riverside, however, trees originating from buds of a heavily affected tree produced an average of 47, and those from buds of a slightly affected tree 21 per cent. granulated fruit. This irregularity seems to indicate that selection of suitable buds and rootstocks would be merely casual. The age, growth rate, part of tree, rootstock, seasonal variations, and geographical position all affect granulation. Buds from the same parent tree grafted on to similar stocks showed more granulation when grown in the coastal area than in the interior.

GUILLEMAT (J.). **Quelques observations sur la trachéomycose du 'Coffea excelsa'.** [Some observations on tracheomycosis of *Coffea excelsa*.]—*Rev. Bot. appl.*, xxvi, 287–288, pp. 542–550, 4 figs., 1946.

During 1937–8, *Coffea excelsa* trees cultivated in the Ubangi area of French Equatorial Africa developed a disease which killed off a few trees aged six to eight years, but which rapidly grew worse, until, up to the present, over 10,000 ha. of these trees have been decimated by the condition. Wild *C. excelsa* trees growing in the neighbouring forests are unaffected. The terminal leaves become crinkled and yellow, dry up, then turn brown, and fall off in a few days. This process, at first confined to one side of the tree, spreads all round. The coffee 'cherries' on the leafless branches turn yellow, blacken, and dry up. Finally nothing remains but a bare tree, the tissues of which dry up in a few days. Sometimes one tree is found to be affected among a number of healthy ones, while some distance away four or five trees together may be killed. No foot rot was present. When sections were made of a branch, trunk, or root of an affected tree, the last annual rings showed brownish, confluent areas, which were most conspicuous on the side of the tree where the disease started. Microscopic examination showed a tracheomycosis, the wood vessels containing hyphae 4 to 5 μ in diameter with septa 10 to 15 μ apart, and sometimes hyaline, oboval chlamydospores rather wider than the hyphae. The surrounding cells blocked the vessels with tyloses.

The fungus was also isolated by Steyaert, who named it *Fusarium xylarioides* [? n. sp., without a Latin diagnosis] on account of the peculiar form of the sclerotioid masses which develop in culture in one to three months. The slightly curved or straight macroconidia are 2- to 3-septate, and measure 20 to 25 by 4 to 5 μ. It is hoped to undertake further study of the fungus.

Tests with various fungicides showed that the fungus was susceptible to copper sulphate. Further work in this direction is indicated. Meantime *C. excelsa* is no longer cultivated locally. Work on the selection of resistant strains of *C. excelsa* has begun.

In a foreword to this paper, A. Chevalier expresses the view that the affected trees are, perhaps, growing under unfavourable conditions, and may need organic and mineral fertilizers. Shade should be provided and excess soil acidity remedied [cf. *R.A.M.*, xxi, p. 408].

Progress Reports from Experiment Stations, season 1944–45.—142 pp., 4 graphs, 1 map, London, Empire Cotton Growing Corporation, 1946.

These reports contain, *inter alia*, the following items of interest [cf. *R.A.M.*, xxiv, p. 448]. Manurial experiments at the Barberton Cotton Experiment Station, South Africa, showed that leaf fall of U. 4/5143 cotton plants, associated with *Alternaria* attack, was sufficiently delayed by applications of potash to have a marked beneficial effect on final yield.

In Southern Rhodesia observations at the height of the growth season showed that groups of plants in a few related cotton strains were noticeably infected by

A. macrospora, identified by J. C. F. Hopkins. The infection did not develop to any extent on the Gatooma Research Station; similar infections occurred on a few local farms.

In the Anglo-Egyptian Sudan work at the Gezira Station proved that all the X 1730 and N.T. 2 cotton strains, including those with added resistance to blackarm [*Xanthomonas malvacearum*], are very highly resistant to leaf curl under Gezira conditions; the N.T. 2 series is also equally resistant at Shambat. At the latter Station the work of transferring blackarm resistance [ibid., xxvi, p. 200] to Domains Sakel cottons, on the 'Egyptian' side, continues at the rate of two back-crosses a year. Over 7,000 acres of blackarm-resistant N.T. 2 were grown commercially, whilst resistant X 1730 reached the 45-acre stage for seventh back-cross material with a 15-acre nucleus of ninth back-cross origin; and a first wave of X 1370 carrying both B_2 and B_3 was synthesized. The report from Kadugli Station states that blackarm in that district appeared in late September, too late to do much damage, and that the introduction of the gene B_2 significantly increased yields where blackarm was present. On pp. 63–64 is a key to the symbols designating the cotton varieties used in the breeding work for blackarm resistance, with notes on their derivation and genetic constitution.

Experiments in the Gezira showed that of the 330 types of durra (*Sorghum* spp.) so far tested a number are immune from or resistant to *Sphacelotheca sorghi* form 3.

In the Kawanda area of Uganda it was found that in blackarm resistance tests the amount of infection obtained by spraying cotton plants with suspensions of *X. malvacearum* in the local water was very unsatisfactory; in 1945 the suspension was made up with rain water with entirely satisfactory results. In a variety trial for wilt (*Verticillium* sp.) resistance the cotton hybrid between K.P. 28 ex B. 181 (resistant) and K.P. 40 ex B.P. 50 (susceptible) was tested against its two parents by inoculation with a culture of the fungus; the percentages of the hybrid plants developing wilt symptoms (using a square root transformation) were close to the geometric means of the figures for the parents.

In Tanganyika the true position of blackarm is not yet fully appreciated; the disease seemed to be doing damage to district cotton on the poorer soils around Ukiriguru; at Lubaga there was a fair amount of bacterial boll rot on one part of the Station, while blackarm and angular leaf spot were rare. It is considered, however, that it would be advisable to add blackarm resistance to any cotton strain introduced into the territory. *Alternaria* was troublesome in patches at Lubaga.

In Nigeria the principal diseases of cotton are leaf curl, to which Ishan A is moderately resistant, blackarm, and anthracnose (*A. macrospora*).

STEYAERT (R. L.). **Le 'wilt' du Cotonnier dû à Fusarium vasinfectum Atk.** [Cotton wilt due to *Fusarium vasinfectum* Atk.]—*Not. phytopath. Inst. nat. Étud. agron. Congo belge* 2, 15 pp., 5 pl., 2 maps, 1945. [Received March, 1947.]

After describing the geographical distribution, symptoms, morphology, pathological biology, manner of propagation, and control of cotton wilt (*Fusarium vasinfectum*) [*R.A.M.*, xxvi, p. 54], the author states that the disease was first definitely recognized in the Belgian Congo in 1937, when it was found at Bambesa [ibid., xviii, p. 797]. By 1945 the infection centres were concentrated in the eastern parts of Uele [ibid., xxv, p. 28]. In December, 1940, legislation was passed by the Province of Stanleyville to limit spread. All export of cotton seed from the Province is forbidden. Within the Province transport of seed in certain directions is also prohibited, while passage from certain areas to others is allowed only under stringent conditions. For control purposes the author recommends that in areas that have become affected only recently the diseased fields should be isolated at once, the crop destroyed, and the area concerned placed under forest fallow. In

badly affected districts only resistant varieties should be planted, the export of seed strictly supervised, and only healthy plants used as seed-bearers. Only the heavy seeds obtained after floating in water and delinting in sulphuric acid should be exported.

BAKKER (J.). **Sterfte in den jongen Rozenaanplant, voorjaar 1946.** [Mortality in young Rose plantings in the spring of 1946.]—*Meded. Direct. Tuinb., 1946*, August, pp. 540–542, 1946.

Investigations are proceeding to determine the underlying factors in the heavy mortality among roses, affecting both young grafted bushes and cuttings at Aalsmeer and other places in Holland in the spring of 1946. Within the former group the die-back [cf. *R.A.M.*, xxii, p. 24] assumed a particularly severe character on large-flowered varieties, such as Geheimrat Duisberg, Better Times, Red Rapture, Roselandia, and Katherina Pechthold, among which losses of 70 to 90 per cent. were not exceptional. The bushes appeared perfectly healthy on planting in November, but by December to January there was no sign of the normal activity in the root system, and at the onset of leafing early in April the white hair rootlets were still lacking, so that with a sunny spell and excessive evaporation most of the shoots shrivelled completely. The yellow leaves fell and the stems, bearing brown to nearly black spots, died back from the tips. In many plants the phloem and some of the vascular bundles were also discoloured. Apparently healthy shoots continued to drop off until mid-May.

None of the physiological or cultural factors investigated bore any definite relation to the pathological condition of the plantings. *Peronospora sparsa* developed on some of the bushes in inadequately ventilated frames following copious watering to correct the desiccation. *Coniothyrium* [*fuckelii*] was undoubtedly concerned in the trouble among the cuttings, but its development is believed to have been secondary to insufficient hygienic precautions and faulty grafting practices.

ROEKENS (F.). **Bladvlekkenziekte der Dahlia (Entyloma dahliae Syd. en Phyllosticta dahliaecola Brun.).** [Dahlia leaf spot disease (*Entyloma dahliae* Syd. and *Phyllosticta dahliaecola* Brun.).]—*Cult. en Handel*, xii, 7, p. 27, 1946.

Attention is drawn to a recent outbreak on dahlia leaves in Belgium of smut (*Entyloma dahliae*) [*R.A.M.*, v, p. 429]. Another leaf spot is caused by *Phyllosticta dahliaecola*, which produces pale or whitish lesions bearing black pycnidia and later turning brown. When the young leaves are attacked the healthy parts continue to develop while the diseased areas remain stationary and subsequently fall out. The pathogens may be combated by prophylactic spring and summer sprays with Bordeaux mixture or other standard fungicides and the collection and destruction of the severely infected leaves. In the autumn, when the tubers are brought in, the infected foliage, etc., should be destroyed and as much of the stem as possible removed. The planting site should be changed wherever practicable and exposed to air and light, while wide spacing is also important. The soil should be deeply dug and limed and a potash fertilizer applied.

TIMMERMANS (A[DRIANA] S.). **Botrytis gladiolorum nov. spec., de veroorzaker van het Botrytis-rot der Gladiolen.** [*Botrytis gladiolorum* n. sp., the agent of the *Botrytis* rot of *Gladioli*.]—*Ned. kruidk. Arch.*, lii, pp. 59–64, 3 figs., 1942. [Received March, 1947.]

This is an abridged version of the author's study on the rot of *Gladiolus* corms in Holland caused by *Botrytis gladiolorum*, a fuller account of which has already appeared [*R.A.M.*, xxv, p. 501].

MULDER (A.). **De Helleboruscultuur en haar moelijkheden in Aalsmeer.** [Hellebore cultivation and its difficulties at Aalsmeer.]—*Tuinbouw, 1946*, 2, pp. 11–16, 1 fig., 1946.

Christmas rose (*Helleborus niger*), well known for its medicinal properties, is cultivated at Aalsmeer, Holland, chiefly as an ornamental. Of the 17 fungal pathogens recorded on the plant, *Coniothyrium hellebori* [*R.A.M.*, vii, pp. 12, 326] is the most troublesome locally, appearing on the young foliage in the spring after a spell of cold weather with easterly winds. The spots formed on the leaves are dark brown, irregular, sharply delimited, confluent, and sometimes concentrically zonate. A diseased plant constitutes a radius of infection, which spreads through an entire planting in two to four days, so that prompt destruction as soon as the symptoms develop is the principal, and at the moment the only known, means of control.

GUISCAFRÉ-ARRILLAGA (J.), VÉLEZ (I.), OTERO (J. I.), & GONZÁLEZ-MÁS (A.). **Botany and horticulture.**—*Rep. Inst. trop. Agric., P. R., 1945–46*, pp. 28–33, 1 fig., 1946.

During observations in Puerto Rico on the susceptibility of the Gramineae to fungi *Uromyces ignobilis* was found on the seeds of *Stenotaphrum secundatum* and other grasses. Grasses most susceptible to *Claviceps paspali* [*R.A.M.*, xxiv, p. 233] were *Paspalum millegrana*, *P. dilatatum*, *P. humboldtianum*, and *P. plicatulum*.

WEST (E.). **Sclerotium rolfsii Sacc. and its perfect stage on Climbing Fig.**—*Phytopathology*, xxxvii, 1, pp. 67–69, 1 fig., 1947.

In July, 1945, *Sclerotium rolfsii* was detected on several roughly semi-circular areas with a radius of 6 to 18 in. on dead climbing fig (*Ficus pumila*) leaves on the north wall of a greenhouse at the Florida Agricultural Experiment Station. The white to pale mycelium, which was particularly conspicuous on the tender, green stems and lower sides of leaves, united some of the adjacent leaves and radiated fan-like over newly affected patches. Small, subspherical sclerotia were formed on the dead stems and along the margins of the diseased leaves. The dead foliage was mostly reddish-brown, but the latest affected leaves were brownish-olive. Young stems and leaves were killed immediately, while older defoliated stems survived and subsequently produced new sprouts. Cultures on potato dextrose agar inoculated either with sclerotia or fragments of the advancing mycelial margin were typical of *S. rolfsii* and produced numerous tan sclerotia about 1 mm. in diameter.

A basidial stage of the fungus was discovered on the shaded lower sides of the leaves in the middle or inner layers of plants during sunny spells of two to three days following four- to six-day rainy periods. A few patches of this phase were again observed in June and July, 1946. The areolate, putty-coloured hymenium is 30 to 40 μ in thickness and the obovoid basidia measure 7 to 9 by 4 to 5 μ, each bearing two or four parallel or divergent sterigmata, 2·5 to 4 or occasionally up to 6 μ in length. The elliptical to obovate, hyaline, smooth spores are rounded above, rounded or apiculate at the base, and measure 6 to 7 by 3·5 to 5 μ. These dimensions fall within the limits given by Goto for *Corticium centrifugum* [*R.A.M.*, x, p. 345], but other characters, such as hymenial colour and density, are quite different. The basidia, sterigmata, and spores of the fig pathogen agree very well with those reported by Curzi for *C. rolfsii* [ibid., xi, p. 748], and since the other characters of that species were described from cultural material, discrepancies between them and the naturally produced fructifications on *F. pumila* may be disregarded. For the present, therefore, the basidial stage on fig leaves is regarded as identical with *C. rolfsii* (Sacc.) Curzi, but since *C.* spp. with an areolate hymenium, short-celled, stout hyphae, right-angled mycelial branching, and stout basidia have

been segregated in the genus *Pellicularia* [ibid., xxii, p. 372], the combination *P. rolfsii* (Sacc.) n. comb. is proposed as the correct name.

Of 15 single-basidiospore cultures, some mycelia were typical of *S. rolfsii* and resembled *S. delphinii* [ibid., xi, pp. 747–749] or were intermediate. All the isolates were parasitic on lupin (*Lupinus augustifolius*).

FOSTERIS (S.). **Un nouveau champignon imparfait : Cladosporium moldavicum nov. sp.** [A new imperfect fungus: *Cladosporium moldavicum* n. sp.]—*Bull. Sect. Sci. Acad. roum.*, xxvi, 7, pp. 492–495, 2 figs., 1944. [Received February, 1947.]

Cladosporium moldavicum n. sp., parasitic on all the aerial organs of *Festuca ovina* and *Avenastrum planiculme* in Rumania, is characterized by straight, simple, continuous or uni-, rarely biseptate conidiophores, dark brown at the base, becoming paler towards the apex, 75 to 200 by 3 to 5, mostly 130 by 4 μ, and acrogenous, oval or elongated, finely punctuate, yellow-brown conidia, continuous (4 to 14 by 4 to 5 μ), uniseptate (6 to 14 by 4 to 6 μ), rarely biseptate (4 to 18 by 5 to 7 μ), or very occasionally triseptate (18 to 23 by 5 to 8 μ).

Fruit bud development illustrated by a series of charts.—*Bull. Minist. Agric., Lond.*, 137, 7 col. pl., 1946. 2*s*. net.

This bulletin, prepared with the assistance of the Fruit Research Stations, the Association of British Insecticide Manufacturers, M. H. Moore, G. L. Hey, E. Holmes, and Dorothy Fitchew, contains 43 coloured illustrations depicting the bud development stages that are important when spraying or dusting apple, pear, plum, cherry, black currant, gooseberry, and raspberry. A standard name is applied to each stage, but spraying instructions have been purposely omitted, the bulletin thus consisting solely of botanical illustrations applicable for all seasons and all districts.

ROLAND (G.). **La septoriose du Poirier.** [Pear-tree septoriosis.]—*Fruit belge*, xiv, 65, pp. 32–36, 1946 [on p. 1 given as xiii, 64, pp. 32–36, 1945].

The author gives a succinct account of the symptoms of pear leaf fleck (*Mycosphaerella sentina*) [*R.A.M.*, xxvi, p. 64], the life-cycle of the fungus, varietal susceptibility, and control, based on the literature. The disease is not very important, as a rule, in Belgium, but causes a good deal of damage in years when a hot, early spring is experienced.

DELHAYE (R.). **Note sur la moissisure rose de Poires sur l'arbre.** [Note on pink mould of Pears on the tree.]—*Fruit belge*, xii, 58, pp. 55, 56, 1944; 59–60, 1 pl., 1945. [Received April, 1947.]

It was noticed after the wet summer of 1943 at La Hulpe and Hoeilaart, Belgium, that pears bore patches of the pink mould fungus [*Trichothecium roseum*: cf. *R.A.M.*, x, p. 320] while still on the tree, in some cases when they were quite ripe and in others when they were still green. The mould followed a fairly severe attack of scab [*Venturia pirina*].

KIENHOLZ (J. R.). **Pinto leaf, a transmissible disease of cherry.**—*Phytopathology*, xxxvii, 1, pp. 64–66, 1 fig., 1947.

An unusual type of foliar chlorosis on two Napoleon (Royal Ann) cherry trees first observed at The Dalles, Oregon, in June, 1943, is termed 'pinto leaf' on account of the resemblance of the blotchy pattern to that of certain western horses know as 'pinto ponies'. Subsequent surveys in the same district disclosed the

presence of the disease on other Napoleon trees, as well as on the Black Republican and Stark Gold varieties and mazzard seedlings, two of the last-named also having been found at Hood River, Oregon. The disorder is of minor importance at present owing to its restricted distribution.

The original pale green to yellow of the chlorotic patches of variable size gradually changes to bright yellow or white. Any part of the leaf may be involved, but a specific pattern is rarely formed. On mazzards, in particular, the chlorosis often appears as a coarse, indefinite stippling. The foliage of terminal shoots is seldom affected, but when it is a few of the basal leaves may show 'pinto' symptoms late in the season. Severely diseased trees are slightly stunted, produce less new growth, and the foliage presents a slightly ruffled aspect from a distance. Affected Napoleon and Stark Gold fruits failed to mature properly, the former remaining yellowish-green and the latter undersized, while the flavour of both was inferior.

Buds from 'pinto' trees were inserted into 13 symptomless sweet cherry seedlings towards the end of June, 1943, and during the following spring the typical features of the disease developed in three. In August, 1944, a series of buds from symptomless terminal shoots of diseased trees was inserted into 20 healthy mazzards, while a second group of 24 seedling trees was budded with infected heel spurs that had produced visible foliar symptoms. By the early spring of 1945 only one of the former and five of the latter group had contracted the disease.

The symptoms of 'pinto' resemble those of the apple mosaic virus [*R.A.M.*, xii, p. 636] the grape [vine] mosaic virus [ibid., xxv, p. 201], peach calico [ibid., xxiv, p. 65], and a 'white spot' disease of cherry [ibid., xix, p. 416; xxiv, p. 324] except for the characteristic 'oak leaf' design of the last-named, but are distinct from cherry line pattern [peach line-pattern virosis virus: ibid., xxv, p. 218]. Buds from a white-spotted Black Republican tree failed to transmit the symptoms when worked on to mazzard seedlings. Negative results were given by experiments in the transmission of 'pinto' to a number of stone and pome fruits. The Latin binomial *Marmor pintofolium* is proposed for the causal virus.

Zeller (S. M.) & Milbrath (J. A.). **Mild rusty mottle of Sweet Cherry (Prunus avium).**—*Phytopathology*, xxxvii, 2, pp. 77–84, 1 fig., 1947.

Mild rusty mottle, observed in Oregon and parts of Idaho and Washington on Bing, Black Republican, Black Tartarian, Lambert, and Napoleon sweet cherries and isolated from the sour Montmorency during the last six or seven years, appears to be distinct from the severe form of the same virus described by Reeves from Washington [*R.A.M.*, xx, p. 25]. Affected sweet cherry trees survive for a number of years, but seem to be more liable to winter injury and drought than healthy ones. The leaves show a rusty, bronzed mottle unaccompanied, however, by the necrosis commonly associated with the acute form of the disease. The mottling originates in May or early June as yellowish or pale green areas of variable shape. If circular, the centres are paler yellow than the margins, which gradually turn bronze or reddish, first on the upper and later on the under side. On other leaves the bronzing or rustiness may take the form of minute stipples, starting on or near the veins, usually at the base of the lamina, before extending to the mesophyll. If the rustiness follows a line pattern or rings, one side at least generally presents a feathered-out appearance. Leaves emerging early or shaded towards the middle of the tree may display a bright yellow or whitish mottle and be rapidly shed, and in exceptional cases a fairly heavy loss of mottled foliage may occur even before harvest-time. Delayed ripening of the fruit is a feature of rusty mottle, and the colour of Napoleon verges on clear yellow instead of the normal red.

The leaves of Montmorency sour cherries affected by the mild rusty-mottle virus showed a faint mottling and were abnormally small. On the under side a reddish necrosis originates along the veinlets and gradually spreads over the whole surface,

which presents a rusty coloration. By this time necrosis has developed in the older chlorotic spots on the upper side.

The disease was readily transmitted by graft inoculations to sweet and sour cherry, peach, flowering cherry (*Prunus serrulata*), and Italian prune. The mild rusty-mottle symptoms were about equally prominent in all the seven sweet cherry varieties tested, except for an occasional golden, marbled mottle with little bronzing or rustiness on Black Republican foliage. Slight necrosis may develop towards the end of the summer, but the acute form associated with severe rusty mottle or the type reported by Rhoads from Utah [ibid., xxiv, p. 324] was not observed. All the peach varieties and the Italian prune used in the trials were symptomless, as also was the Montmorency sour cherry for the greater part of the season, after the bronzed leaves were shed.

The following are important differences between mild and severe rusty mottle. The former does not cause nearly so rapid a decline of old sweet cherry trees as the latter, nor does it reduce the size or impair the quality of the fruit. The roughened bark mentioned by Rhoads as typical of the Utah form of the disease has never been noted in trees infected by mild rusty mottle, but a superficial splitting of the bark developed on one-year-old wood of three Bing cherries inoculated with severe rusty mottle from Washington. Defoliation in trees affected by the mild strain is not sufficiently extensive to give them the bare appearance of those attacked by severe rusty mottle. Acute necrosis of the chlorotic areas usually develops by the late spring or early summer in sweet cherry foliage infected by severe rusty mottle, but seldom or never occurs in the mild form of the disease. Again, in the severe type after 1st June rusty mottle shows on the leaves almost to the branch tips, while the symptoms of the mild virus only become apparent some distance back from this point. Peaches, *P. virginiana*, and some *P. serrulata* varieties react negatively to inoculation with the mild strain, whereas the severe one induces in those hosts a similar rustiness and bronzing to that observed in sweet cherries.

In peaches, Tilton apricots, and *P. serrulata* the severe rusty-mottle symptoms originate as a chlorotic mottling distributed over the leaves in circular areas with diffuse margins, somewhat resembling those of asteroid spot [ibid., xvii, p. 609], which is gradually superseded by a yellow to rusty-orange coloration with greenish islands.

Control of mild rusty mottle may be effected by the use of clean scion wood in nurseries and the roguing-out of affected trees in the orchard.

Blodgett (E. C.). **Rusty spot of Peach.**—*Phytopathology*, xxxvii, 2, pp. 145–147, 1 fig., 1947.

Rusty spot of peach, originally described by the writer from Idaho in 1941 [*R.A.M.*, xx, p. 311], has since been reported (*in litt.*) by E. L. Reeves from Washington, G. Stout from California, and H. R. McLarty from British Columbia, occasionally assuming a severe form in the two first-named.

In September, 1940, seven peach seedlings at the Idaho Agricultural Experiment Station were inoculated with three buds each of material from the orchard where the disease was first reported. No symptoms developed until August, 1945, when most of the fruits on six of the trees showed more or less severe rusty spot. One of these trees was known with certainty to represent the original under stock, the others being possibly developments of the scion. In the former the factor responsible for rusty spot was evidently either transmitted or provided contamination from the scion buds. Of a number of adjacent trees and others in the plots, including controls and some inoculated with various budwood collections, only one peach seedling contiguous to the infected trees bore a single rusty-spot and several healthy fruits; it had been inoculated in 1940 with buds of red-leaf chokecherry [*Prunus virginiana*].

Whether the rusty-spot factor is transmissible (as a virus), perpetuated (as a genetic abnormality), or carried mechanically (as an organism), the use of budwood from diseased trees for propagation should be discouraged. The occurrence of the trouble on one tree not inoculated with rusty-spot material indicates the possibility of orchard spread.

Leach (R.). **Banana leaf spot (Mycosphaerella musicola) on the Gros Michel variety in Jamaica. Investigations on the aetiology of the disease and the principles of control by spraying.**—118 pp., 19 pl., 2 figs., 1 diag., 4 graphs, Government Printer, Kingston, 1946. 2*s*.

A brief summary of previous work on banana leaf spot (*Mycosphaerella musicola*) is given, with special reference to the initiation of spraying for its control on the Gros Michel variety. This practice was already established in Jamaica in 1940, when the author began his studies on the etiology of the disease to determine the principles on which a reduction in the number of spraying cycles could be safely based [*R.A.M.*, xx, p. 265; xxi, p. 381].

The perithecia, sporodochia, and spermogonia of *M. musicola* may develop in very variable proportions. Perithecial production is normally seasonal, occurring for the most part between August and December, during which period the numbers of sporodochia also tend to increase. The distribution of spots on a leaf differs with the type of spore giving rise to infection, the conidia producing typical 'line-spotting', primarily on the heart leaves, while the ascospores cause 'tip-spotting', mostly on the under sides of the youngest open leaves. Symptoms of the rare secondary infections caused by both spore types are also described.

The viability of the conidia is determined by the degree of maturity attained during their development. The seasonal decline in the activity of these organs in the colder months is correlated with their retarded development during the cooler nights, especially in January and February. Germination is inhibited by the biological antagonism of epiphytic mycelia and a gummy residue from the dew on the surfaces of the older leaves. Infection by means of the germ-tubes is regulated by their hydrotropic response towards open stomata. The stomata on the upper side open later in the morning and close earlier in the evening than those on the lower surface, on which infection through these apertures is much more consistent than on the upper.

Latency in spot development is closely correlated with the intensity of infection per unit area of foliar surface. Heavy spore infection results in the early appearance of the individual spots, the resistance of the host cells evidently collapsing under the influence of a toxin secreted in increasing profusion with the development of the intercellular hyphae.

It has been shown by experiments that nearly all infection by *M. musicola* in Jamaica is primary. Conidial infection is amenable to control by the regular three- to four-weekly spraying cycles, which are not, however, effective against the ascospores. The basic principle of leaf-spot prevention, therefore, is the attainment of a high standard of control of conidial infection during the spring and summer before the opening of the normal season of ascospore activity. Spraying controls conidial infection by the suppression of sporodochical sporulation and rendering the dew toxic to any conidia disseminated therein. Neither of these factors influences ascospore infection.

Certain soil conditions affect the metabolism of banana foliage in such a way as to stimulate the continuous production by *M. musicola* of an abnormally large number of perithecia, ascospore infection falling to a minimum only in the colder months [ibid., xxii, p. 172]. The standard spraying schedule being ineffectual against infection from this source, tip-spotting is likely to be very troublesome on such soils during the winter unless the control campaign is considerably intensified.

According to R. F. Innes, Agricultural Chemist, Department of Agriculture, out-of-season tip-spotting is associated with poor soil aeration, marked fluctuations in the oxidation-reduction relations, and shallow tilth layers, which may be counteracted by soil conservation measures, drainage, and any field practices contributing to the improvement of soil crumb and structure stabilities and the deepening and aeration of the surface tilth layer.

The importance of trash disposal is emphasized, especially in localities where spring and summer ascospore infection is prevalent. The operation should be carried out in the dry early spring (March) in preference to August, as ordinarily recommended. Fertilizers have not only failed to confer resistance to leaf spot but even adversely affected the control of conidial infection.

The vegetative growth of the plants is not appreciably impaired by leaf spot, but fruit production may suffer considerably, bunch formation being delayed and the size of finger (quality of individual fruits) and number of hands (grade) reduced in the order given. When the disease is brought under control the quality of the fruits is improved before the grade. Plants above a certain height (dependent on the severity and duration of infection in a given plantation) should be cut back before the commencement of spraying. In a badly diseased field time and material are wasted on any plants more than two-thirds the height of those with 'shot' bunches, since their fruit would probably be valueless however thorough the treatment. Such useless taller plants, moreover, serve as an additional source of infection to the shorter ones around them.

Symptoms of line- or tip-spotting on an individual leaf afford reliable evidence of the extent of infection at the time of unfolding, and may be used, having regard to the correlation between latency and intensity of infection, for the determination of the dates of seasonal fluctuations of the disease. These are discussed in relation to the four main climatic regions into which the banana districts can be divided, namely, western, central, northern, and eastern, with special reference to the periods at which spraying may be omitted with the maximum degree of safety. A considerable acreage of bananas in the western region, where the rainfall is practically continuous from April to November, falls within the radius of summer ascospore infection; tip-spotting assumes an acute form as early as July and may reach destructive proportions by January unless the regular summer spraying schedule is amplified considerably beyond twelve monthly cycles per annum. On the other hand, in the Lower Montego River Valley, where summer ascospore infection is absent, it may be feasible to curtail the treatments between the beginning of December and the end of April once a high standard of control has been secured by the routine summer programme. A similar course should also be practicable at the higher elevations of the central region, but on the irrigated coastal plains, where conidial production is abundant and atmospheric conditions conducive to infection, intensive spraying from June to September is necessary to prevent winter tip-spotting. The soils of the northern region tend to promote out-of-season ascospore infection, so that effective control can only be maintained by strict attention to summer spraying; tip-spotting may persist into March unless elimination has been largely accomplished before October. The enhanced viability of the conidia in this region precludes the discontinuance of spraying for more than two months in the year (January and February). In the eastern region, where only small areas are involved in summer ascospore infection, leaf spot can generally be combated by spring and summer treatments, and spraying may be omitted from December to March.

Orton (E. C.). **Dipping trials in drying fruit.**—*Aust. Dried Fruits News*, xxi, 11, p. 5, 1946.

Reasonably good control of [unspecified] moulds on sultanas drying on racks

was secured at the Commonwealth Research Station, Merbein, Victoria, by spraying with a cold dip of 3 to 4 per cent. caustic potash plus 1 per cent. shirlan, but sulphuring was more effective. Special hessian crepe side curtains, 50 yds. by 9 ft., were used and the sulphur was burnt in shallow pans (2 to 3 lb. per container) under each bay or every other one. Promising results were given in laboratory trials with calcium propionate, an effective preventive of moulds in flour [*R.A.M.*, xxi, p. 342].

JENSEN (H. L.). **Observations on properties of certain fungicidal compounds.**—*Proc. Linn. Soc. N.S.W.*, lxxi, 3–4, pp. 119–129, 1 pl., 1946.

A number of fungicides were tested for their efficiency in the control of mould growth in the tropics on various industrial organic products used for military equipment [cf. *R.A.M.*, xxvi, p. 71]. The 23 organisms concerned in the spoilage were broadly divisible into two groups according to their action, viz. (A) *Stachybotrys* sp., isolated from a decayed sandbag, two strains of *Memnoniella echinata* [cf. above, p. 231], *Helminthosporium* sp., *Curvularia lunata*, *Pestalotia palmarum*, *Chaetomium funicola* [ibid., vi, p. 296], two sterile mycelia, and *Actinomyces* sp. from rotted tent canvas, and *Alternaria* sp. from flax straw; and (B) comprising *Aspergillus niger* from copper oleate-treated canvas, two strains of *A. flavus*, one from mouldy leather and the other from canvas treated with salicylanilide, four isolates of *Penicillium* from (*a*) a wireless set [ibid., xxiv, p. 379], (*b*) and (*c*) canvas treated with copper oleostearate, and (*d*) infected human blood serum with 0·01 per cent. merthiolate, *Paecilomyces* sp. from copper tannate-treated canvas, three strains of *Fusarium* from mouldy tent canvas, and *Pestalotia* sp. from mouldy leather.

The most active cellulose-destroyers in group (A) were *Stachybotrys* sp. and *M. echinata*, which caused a virtually complete loss of tensile strength of 12-oz. cotton duck on a mineral salts-agar medium after a week to a fortnight's incubation at 30° C. Next in order of virulence came *Actinomyces* sp., sterile mycelium (*b*), *C. funicola*, *Curvularia lunata*, and *P. palmarum*, which were responsible for 50 to 80 per cent. loss of strength in a fortnight, while *H.* sp., *Alternaria* sp., and sterile mycelium (*a*) were less active, causing only 10 to 30 per cent. reduction.

Of the fungicides tested, tri-, tetra-, and pentachlorophenol, paranitrophenol, and dinitro-ortho-cresol were most effective at an acid hydrogen-ion concentration (pH 4·7 to 4·8) where the compounds were present as non-ionized molecules, their toxicity and acidic strength increasing with the number of chlorine atoms or nitro groups. Salicylanilide was fairly efficient on the whole, though some of the more resistant fungi were not totally inhibited even at a concentration of 0·2 per cent. at an acid reaction, while in a few other cases moderate concentrations of 1 in 10 to 20,000 caused complete cessation of growth, which was resumed, however, at higher ones; isolate (*b*) of *Aspergillus flavus* gave evidence of ability to decompose this compound under certain conditions. Zephiran, an invert soap, gave very satisfactory results at a neutral reaction but was rather less active at pH 4·7 to 4·8. Phenylmercuric acetate was the most toxic of the compounds tested, especially at pH 4·7 to 4·8, where it was more ionized than at 7. It is tentatively assumed that the substituted phenols act on chemical groups in the cell interior and phenylmercuric acetate on sulphydryl groups at the surface. The fungistatic properties of copper sulphate were of a low order.

The results of supplementary experiments indicated that tetramethyl- and tetraethyl-thiuramdisulphide and tetrachlorobenzoquinone were similar to, or somewhat higher than, salicylanilide in fungistatic value. DDT (dichlorodiphenyltrichloroethane) proved useless for the object in view [cf. ibid., xxiv, pp. 198, 246, *et passim*].

Barail (L.). **Toxicity of germicides.**—*Amer. Dyest. Reptr*, xxxv, 22, pp. 521–524, 1946.

Of over 250 compounds tested for their germicidal and fungicidal efficiency in the treatment of fabrics, only 15 were found to be suitable for the purpose in view, and of these not more than seven were non-toxic to rabbits in intraperitoneal infections. Only six caused no irritation of the skin, and of these three could not be used on light materials, while one alone (lactoxy-phenylmercuric ammonium lactate) was both non-irritating and non-sensitizing even at a concentration as high as 1 per cent. It is concluded from these results that many manufacturers make exaggerated claims, not only for the efficacy of their products, but also for their low toxicity and absence of irritant properties. The great value of the patch-test method of Schwartz and Peck (applicable to human beings) in the elimination of injurious preparations is emphasized.

Horsey (R. E.). **Hundred mills specify mildewproofing wants.**—*Text. World*, xcvi, 8, p. 123, 1 fig., 1946.

The need during the war for a compound that would protect textiles from mildew in the tropics led to the development of dihydroxy-dichloro-diphenylmethane, commonly known as G–4. Valuable information as to the peace-time requirements of 99 United States mills was elicited from the replies to a questionnaire, the following properties being listed as essential in mildew-resistant finishes: freedom from odour and corrosive action, absence of toxicity, resistance to weather (heat, light, and water), durability, and flexibility. Of 63 organizations expressing preference for a particular type of finish, 36 (57 per cent.) were in favour of chlorinated phenol, 15 (24) of mercurials, and 12 (19) of metallic soaps.

Bayley (C. H.) & Weatherburn (Muriel W.). **The effect of weathering on various rotproofing treatments applied to Cotton tentage duck.**—*Canad. J. Res.*, Sect. F, xxv, 1, pp. 92–109, 1 pl., 1947.

Cotton tentage duck treated against rotting by microbiological agency [*R.A.M.*, xxv, p. 355] with ferric oxide-chromic oxide (mineral khaki) [ibid., xxv, p. 516], copper carbonate-ferric oxide (copper-iron), cuprammonium, cutch-cuprammonium, copper 8-quinolate, copper glyoxime, 2,2′-dihydroxy-5,5′ dichlorodiphenylmethane (G–4) [ibid., xxv, p. 515], zinc dimethyldithiocarbamate [zerlate], copper naphthenate, copper hydroxynaphthenate, zinc naphthenate, or mercuric naphthenate showed various degrees of loss in breaking strength when exposed to outdoor weathering in summer. The losses, however, were in no instance greater than with untreated fabric, and some treatments, e.g., mineral khaki and cutch-cuprammonium, gave marked protection against loss in breaking strength. With copper naphthenate, copper hydroxynaphthenate, and mercuric naphthenate the degree of chemical degradation, as measured by cuprammonium fluidity, was rather greater than in the untreated fabric. Waterproofing by a mixture of petroleum-base waxes in addition to the rot-proofing treatments generally increased the breaking-strength loss. The water resistance of the waxed samples showed slight to conspicuous increase after weathering. In general, there was marked loss of rot proofer as a result of weathering, the loss amounting to 37 to 90 per cent. with the copper compounds, though reduced to 6 to 44 per cent. by the presence of wax. Weathering caused almost complete loss of the two zinc compounds, G–4 and mercuric naphthenate. Losses of metal from chromium-iron proofings were negligible even in the absence of wax proofing. Degree of rot resistance, as estimated by soil burial, was greatest in the copper treatments, and was increased by wax. The water resistance of fabrics subjected to soil burial was often decreased before the occurrence of any marked loss in breaking strength, indicating microbiological attack on the wax coating before attack on the fabric.

SHEMA (B. F.). **Method for evaluating the fungicidal properties of treated paper and paperboard.**—*Paper Tr. J.*, Tech. Sect., cxxiii, 23, pp. 179–180, 1946.

The following simple method is proposed for the evaluation of the fungicidal properties of treated paper and paperboard, using *Chaetomium globosum* and *Aspergillus niger* as the test organisms. Two-in. squares of the samples are placed on the surface of a medium consisting of 1,000 ml. tap-water, 3 gm. sodium nitrate, 1 gm. dipotassium hydrogen phosphate, 0·25 gm. each of potassium chloride and magnesium sulphate, and 10 gm. agar, sterilized at 15 lb. pressure for 20 minutes at 120° C. and adjusted to pH 6·8 to 7. Suspensions of the test fungi from 14-day-old cultures in 8-oz. bottles containing 0·5- to 0·75-in. glass beads, a disk of filter paper cut in four sections, and 20 ml. of the nutrient salt medium, are distributed over the paper samples and the dishes incubated for two to three weeks at 26° to 30°, after which the efficacy of the various treatments may be determined by visual inspection.

At the Institute of Paper Chemistry, Appleton, Wisconsin, this procedure was applied to over 70 samples, including papers and board impregnated with disinfectants or coated with cellulose acetate and casein containing a fungicide. Experimental data showed *A. niger* to be the more resistant of the two organisms on samples treated with mercury compounds, but in all the other tests, notably those involving the use of chlorinated phenols, the results were essentially identical for both moulds.

ROSE (C. D.). **A new staining method to demonstrate the presence of mould in vegetable-tanned leather.**—*Rep. Brit. Leath. Mfrs Ass.*, xxv, 3, pp. 489–491, 1 fig., 1946.

Thin sections of leather are first soaked in a mixture of 70 per cent. acetone and 30 per cent. distilled water (changed at least once) to remove the tan. They are then transferred to a 50–50 acetone distilled water mixture, and then to the stain for 5 to 15 seconds. The stain consists of 0·9 gm. pyronin, 0·1 gm. methylene green, 9 c.c. alcohol (98 per cent.), 10 c.c. glycerol, plus phenol (0·5 per cent. aq.) to make up to 100 c.c. The stained sections are washed in 50 per cent. alcohol several times, dehydrated, and cleared in clove oil and xylol. The hyphae stain red against a pink background, the spores turning a much deeper colour.

This method has the advantage of being easier to standardize than the methylene blue method, the stain does not fade, the acetone solution causes much less distortion of fibre structure than the alkali method of stripping, and, finally, no bleaching is necessary.

VERONA (O.). **Di una singolare vegetazione microbica del sapone.** [On an unusual microbial growth on soap.]—Reprinted from *Ann. Fac. agr. Pisa,* N.S., vi, 7 pp., 3 figs., 1945. [Received March, 1947.]

From a mouldy bar of green household soap (18·7 per cent. moisture, 35·7 per cent. total fats, and strongly alkaline) purchased through the ordinary commercial channels and kept in the house, the author isolated an organism provisionally named *Micrococcus saponophilus* n. sp., *Penicillium crustosum* [*R.A.M.*, xviii, p. 712], *P. flavidorsum* (showing a continuous, not zonate, growth), and a species of *Cladosporium*. Experimental evidence indicated that the infection was favoured by the high moisture content of the soap, the alkali tolerance of the organisms, and their ability (though limited) to attack fats.

STEYAERT (R. L.). **Une technique rapide permettant le montage au baume de matériel botanique.** [A rapid technique for mounting botanical material in balsam.]—*Parasitica*, ii, 4, pp. 137–138, 1946.

The author describes the following method of permanently preserving microscopic preparations such as scrapings from leaves, bark, or fruits, or hand sections.

Drops of chloralphenol (equal weights of chloral hydrate and phenol crystals), which is miscible with both water and balsam, are deposited near the cover slip while the aqueous medium in which the material was examined is withdrawn by pieces of filter paper. The slides are then gently heated to remove air bubbles. The treatment with chloralphenol is repeated until all the water has been removed. Drops of balsam dissolved in xylol are then deposited near the edge of the cover, and the chloralphenol is drawn out with filter paper, being replaced by balsam. The slides are then heated rather more strongly until the remaining chloralphenol has evaporated. More balsam should be added gradually as the xylol evaporates; if this is not done, air bubbles form under the cover slip. The preparation is thus finally mounted in pure balsam.

The only unsuitable materials for this technique are hyaline spores or mycelia which are almost invisible in the balsam. One further drawback arises when free spores are present, which may become displaced or disappear during the mixing of the two media. In such a case, the scrapings can be placed directly in a mixture of chloralphenol and Canada balsam dissolved in xylol. The chloralphenol clears the material and secures the penetration of the balsam. With cover slip in place the slides are warmed to evaporate the chloralphenol. This method can be used only for herbarium material or material previously dried.

CARLSON (J. G.), HOLLAENDER (A.), & GAULDEN (MARY E.). **Ultraviolet radiation as a means of sterilizing tissue culture materials.**—*Science*, cv, 2720, pp. 187–188, 2 figs., 1947.

For sterilizing tissue-culture materials, including physiological salt solutions, by means of ultra-violet radiation of wave-length 2,537 Å [*R.A.M.*, xxiii, p. 140] the authors have devised a special apparatus. An aluminium-lined box containing an 8-watt, commercial, low-pressure, mercury vapour lamp is covered by a transparent shield to protect the eyes, consisting of a sheet of unexposed, processed X-ray film which absorbs practically all the 2,537 Å ultra-violet rays striking it. The aluminium cover of the box has openings for dissecting instruments, cover-glasses, and slides. The instruments are kept sterile by exposure to radiation when not in use. A few minutes before a set of preparations is to be made, cover-glasses and depression slides are inverted over the larger openings. Flasks stand on the bottom of the box and cellophane is placed under the corks to prevent mould growth and check entry of contaminants. Five minutes irradiation is considered sufficient for sterilization.

JENKINS (ANNA E.). **A specific term for diseases caused by Elsinoë and Sphaceloma.** —*Plant Dis. Reptr*, xxxi, 2, p. 71, 1947. [Mimeographed.]

The author has decided to adopt the term 'spot anthracnoses' to designate collectively and specifically the diseases caused by *Elsinoë* and *Sphaceloma*. It was originally used, in the singular and in French ('anthracnose maculée'), by E. Fabre and F. Dunal in 1853 to denote the vine disease the pathogen of which was described by de Bary in 1874 as *S. ampelinum* [*E. ampelina*: cf. *R.A.M.*, xxi, p. 225].

RAMSBOTTOM (J.). **Fungi and modern affairs.**—*Rep. Smithson. Instn, 1945*, pp. 313–326, 1946.

This paper, the substance of three lectures delivered at the Royal Institution in 1944, is a reprint, with additions, of that already noticed [*R.A.M.*, xxiii, p. 397].

STEVENS (N. E.) & STEVENS (R. B.). **Plant diseases during the years 1941–1945 in the United States and Canada.**—*Bot. Rev.*, xiii, 2, pp. 92–115, 2 graphs, 7 maps, 1947.

This is a summarized account, based largely on information that has appeared from time to time in the *Plant Disease Reporter*, on the incidence of and the losses

sustained in the United States and Canada from 1941 to 1945, inclusive, from some of the more important plant diseases [cf. *R.A.M.*, xxi, p. 213]. Much of the information presented has already been noticed in this *Review*.

OWEN (H.). **Mosaic diseases of Malvaceae in Trinidad, B.W.I.**—*Trop. Agriculture, Trin.*, xxiii, 9, pp. 157–162, 2 pl., 1 graph, 1946.

Investigations into mosaic diseases of *Hibiscus esculentus*, *Malachra alceifolia*, *Sida acuta*, *S. glomerata*, *S. linifolia*, *S. rhombifolia*, *S. urens*, and *Triumfetta lappula* (Tiliaceae) in Trinidad are described. Young leaves of *H. esculentus*, when affected, show interveinal angular blotches ranging from palish green to yellow tinted with green. On older, severely affected leaves the whole surface, except for the major veins, is bright yellow or whitish, the normal green extending outwards from the veins in a narrow, undulating band; slight blistering of the surface often occurs. Occasionally, mature or almost mature leaves present only a diffuse yellow-green mottle.

On *M. alceifolia* most young leaves show bright-yellow patches extending over and including the secondary and smaller veins, and sometimes of the primary ones. In some, the veins alone are cleared. More mature leaves may show (1) a bright-yellow or whitish vein-clearing only affecting all veins, the interveinal areas being normal green, (2) vein-clearing with some interveinal chlorosis, (3) least commonly, interveinal chlorosis alone. The three types of symptom intergrade; all three may occur on the same leaf, and do regularly occur on the same plant, but with one type of symptom usually predominating.

On *Sida* spp., apart from a very small amount of vein-clearing seen on a few young leaves of *S. urens*, interveinal chlorosis is general. Areas bounded by the midrib, primary veins, and the margin may be completely chlorotic, or may contain small green islands generally bounded by smaller veins. On other plants, the leaves are dotted with interveinal chlorotic areas. A primary vein between two adjacent chlorotic areas may or may not be chlorotic. It is unusual for the whole interveinal leaf surface to be chlorotic, but this condition may occur in a few older leaves which are generally whitish.

In *S. glomerata* it is more usual for all the affected leaves to become chlorotic over the whole leaf surface, or most of it. The margins of the young leaves may curl downwards, and in all [*Sida*] species there is a tendency for severely affected leaves to be malformed and show a rugose effect.

T. lappula shows two chief types of symptom: conspicuous vein-clearing and sharply defined interveinal chlorosis. Both are often present on the same leaf. Any one plant usually shows a preponderance of one symptom or the other. On the youngest leaves the symptoms consist of small, inconspicuous, pale blotches and veinal chlorosis. As the leaves develop, the markings extend and become brighter and more sharply defined. Veins up to the fourth order may be cleared or may delimit chlorotic areas. Some observational evidence indicates the presence of an insect vector or vectors.

The mosaic was transmitted by grafting from each species found naturally infected (except *S. linifolia*, with which experiments were not made) to healthy plants of the same species. No transmission by sap inoculation or by seed was observed and none occurred in any intergeneric or inter-family grafts. Transmission was effected in every combination between *S. acuta*, *S. rhombifolia*, and *S. urens*, the mosaics of which are accordingly attributed to a single virus. The tentative conclusion is drawn, from the general similarity of the symptoms presented by *Sida* spp. in Trinidad and Brazil [cf. *R.A.M.*, xxiii, p. 439], that the mosaic disease on these plants is the same in both localities, and judging from Silberschmidt's plates and descriptions [loc. cit.] it would appear that his 'infectious chlorosis' of *Abutilon* is due to *Abutilon* virus [*Abutilon* variegation virus] and that the *Sida* mosaic in Trinidad is due to the same virus.

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VAN DER PLANK (J. E.). **A method for estimating the number of random groups of adjacent diseased plants in a homogeneous field.**—*Trans. roy. Soc. S. Afr.*, xxxi, 3, pp. 269–278, 1946.

To determine whether an observed association of diseased plants in a field accords with an hypothesis of random distribution, or whether it is more than can be expected from chance association the author describes the following simple method which has proved to be highly efficient. If n consecutive plants are examined in sequence over a uniform area and of these μ are diseased, then the number of random groups of two adjacent diseased plants ('doublets'), $d = \frac{1}{n}\mu(\mu-1)$. All larger groups of diseased plants are reduced to doublets, three adjacent diseased plants being two doublets, and so on. The distribution belongs to the binomial series and to d is assigned a standard error of $\sqrt{\{d(1-p)\}}$, where $p = \frac{2}{n}$. For high values of n the distribution approaches the Poisson form, d having a standard error of $\sqrt{d}$. Taking as an example Bald's data for the amount of infection by spotted wilt in tomatoes [*R.A.M.*, xvi, p. 843], table 4, p. 24: $n = 360$ (12 rows of 30 plants, considered as if joined end to end in one sequence), $\mu = 173$. The expected number of doublets, if the disease is randomly scattered, is

$$\frac{173 \times 172}{360} = 82{\cdot}7,$$

the standard error $\sqrt{82{\cdot}7}$ or $\pm 9{\cdot}1$. Actually, the number of doublets observed in the field was 81 (24 runs of 2, 9 of 3, 5 of 4, 2 of 5, 2 of 6, and 1 of 7 adjacent diseased plants). Hence, there is no evidence of any spread of infection from neighbour to neighbour, a conclusion which Bald also reached using Cochran's method [ibid., xvi, p. 571].

The method can be applied to groups of any size, though the use of groups larger than doublets is generally unnecessary. The number of random groups of m adjacent diseased plants, $f_m = \frac{\mu(\mu-1)...(\mu-m+1)}{n(n-1)...(n-m+2)}$, $m = 2, 3,...$ where n and μ have the same meaning as before. All larger groups are reduced to groups of m, a run of $m+a$ adjacent diseased plants being taken as $a+1$ groups of m. To f_m is assigned a standard error of $\sqrt{\{f_m(1-p)\}}$, where $p = \frac{m'}{n(n-1)...(n-m+2)}$; for large values of n the standard error reduces to $\sqrt{f_m}$.

In practice, areal gradients of disease should be avoided by dividing the field into small blocks and applying the method to each separately. Provided the blocks are not so small that the distribution of doublets departs considerably from the Poisson form, a result for the whole area may be reached by summing, the same procedure also being applicable when scattered sets of observations have to be gathered together. As an example of this an analysis is made of records of tobacco

kromnek ([tomato] spotted wilt virus) [cf. ibid., xxv, p. 188], which, it is shown, does not spread infectiously from neighbour to neighbour.

STEVENS (N. E.) & NIENOW (INEZ). **Plant disease control by unusual methods.**—*Bot. Rev.*, xiii, 2, pp. 116–124, 1947.

In this paper [cf. *R.A.M.*, xviii, p. 125] a further account is given of some of the less usual methods of plant-disease control that have been suggested or have come into use in recent years. Most of the work referred to has already been noticed in this *Review*.

Antibiotics. Part I: microbiological.—*Ann. N.Y. Acad. Sci.*, xlviii, 2, pp. 31–98, 3 pl., 4 graphs, 1946.

This series of papers is the result of a conference on antibiotics held by the Section of Biology of the New York Academy of Sciences from 17th to 19th January, 1946. The contributions in part I (part II deals with the pharmacological applications of antibiotics) comprise (1) antibiotic substances—contribution of the microbiologist, by S. A. WAKSMAN; (2) the development of improved penicillin-producing moulds, by K. B. RAPER; (3) metabolism of penicillin-producing moulds, by M. J. JOHNSON; (4) production of antibiotic substances by Basidiomycetes, by W. J. ROBBINS, F. KAVANAGH, and ANNETTE HERVEY; (5) production of antibiotic substances by Actinomycetes, by S. A. WAKSMAN, A. SCHATZ, and D. M. REYNOLDS; and (6) antibiotic substances produced by bacteria, by J. W. FOSTER and H. B. WOODRUFF.

HOLTMAN (D. F.). **Antibiotic products of fungi.**—*Bot. Rev.*, xiii, 2, pp. 59–91, 1947.

In this paper the author reviews and discusses with numerous references to the literature of the subject the present state of knowledge concerning some antibiotic products of fungi. The aspects mainly dealt with comprise the prevalence and general characteristics of *Penicillium notatum*, culture media for penicillin production, methods of cultivating *P. notatum*, recovery of penicillin from culture media, and difficulties met with in its production, physical and chemical properties of penicillin, determination of its potency, its mode of action, its effects on infectious diseases, and agents that inactivate it; antibiotics derived from *Aspergillus* spp., and the antibiotic 'chaetomin' [*R.A.M.*, xxv, p. 130], produced by *Chaetomium cochliodes*, are reviewed briefly. A list of 161 references is appended.

WILKINS (W. H.). **Investigation into the production of bacteriostatic substances by fungi. Preliminary examination of the sixth 100 species, more Basidiomycetes of the wood-destroying type.**—*Brit. J. exp. Path.*, xxviii, 1, pp. 53–56, 1947.

The following 14 wood-destroying Basidiomycetes, grown in pure culture on malt and potato dextrose agar and tested by methods described in previous papers of this series [*R.A.M.*, xxiv, p. 158] against *Bacterium coli* and *Staphylococcus aureus*, were strongly positive: *Daedalea unicolor*, *Fomes officinalis*, *Irpex destruens*, *Lenzites sepiaria* strain 10 A, *L. thermophila*, *Polyporus borealis*, *P. obtusus*, *P. spumeus* var. *mongolica*, *Poria crassa*, *P. hymenocystis*, *P. vaporaria* strain 280, *Stereum rameale*, *Trametes lilacino-gilva*, and *T. serialis* strain 107 B. A further 43 were weakly positive and the remainder negative.

BALD (J. G.), NORRIS (D. O.), & HELSON (G. A. H.). **Transmission of Potato virus diseases. 5. Aphid populations, resistance, and tolerance of Potato varieties to leaf roll.**—*Bull. Coun. sci. industr. Res. Aust.* 196, 32 pp., 2 graphs, 1946. [Mimeoprinted.]

In continuation of the studies of potato virus diseases [*R.A.M.*, xxiii, p. 496], healthy plants of different varieties were grown around Up-to-Date plants infected

with leaf roll in field trials and it was noticed that one aphid, *Myzus persicae* [ibid., xxiii, p. 273], attacked both healthy and diseased Up-to-Date and showed no preference for any variety while the other, *Macrosiphum gei*, attacked healthy plants of any variety indiscriminately, and also slightly affected young plants but avoided those seriously stunted. Stages of development seemed to influence the aphid populations which were similar when there was only a slight difference in physiological age of the plants (similarity in stage of maturity reckoned by rate of leaf and shoot expansion). There were significant differences in the susceptibility of the varieties to leaf-roll infection attributed to reactions of the plant tissues. An index of resistance i_s/i, where i is obtained from the formula $P = 100\ (1-e^{-i})$, P being the percentage of infected plants of one variety and e^{-i} the proportion of plants not infected by aphids, and i_s is similarly obtained for a standard susceptible variety gives the probability of a healthy plant becoming infected. By this index it was shown that Bismarck has seven or eight times less likelihood of being infected than Up-to-Date. It was found that the yield of infected plants did not give a consistent indication of tolerance except in extreme cases. Bismarck, as regards yield, again shows itself to be the most resistant and intolerant of the Australian varieties and the authors show how in Bismarck crops leaf roll may tend to be eliminated by a combination of intolerance and resistance under conditions which would rapidly increase the disease in the susceptible Up-to-Date.

HUTTON (E. M.). **The relationship between necrosis and resistance to virus Y in the Potato. 3. Interrelation with virus C.**—*J. Coun. sci. industr. Res. Aust.*, xix, 3, pp. 273–282, 3 pl., 1946.

The aim of the third of this series of investigations [cf. *R.A.M.*, xxv, p. 229] into the reactions of potato virus Y was to compare the effect on potatoes of virus C [a strain of virus Y: ibid., xxv, p. 42] and virus Y separately and to analyse the inheritance of hypersensitivity, with a view to using this as a possible means of control. Duplicate sets of seedlings from selected crosses were inoculated through single leaves, one set with virus Y and one with virus C. The final reactions after six weeks were classified in both cases as mottle, systemic necrosis, leaf drop, leaf-drop streak, collapse or lethal necrosis, top necrosis, and localized necrosis. The percentages of plants falling into the various groups showed a close correlation for the two viruses. A similar correspondence was found in the numerical range of leaf lesions, the commonest in both cases being from 10 to 15 lesions per leaflet, and the total range from few to 120. The course taken by the two diseases is parallel, symptoms appearing on the inoculated leaves on the ninth day, systemic infection on the 13th or 14th, and abscission of the leaves originally inoculated on the 18th. Such similarities further support the suggestion that virus C is a strain of virus Y.

While it was found possible to increase hypersensitivity by selection, and in both cases to produce hypersensitive plants from two tolerant parents, the condition appears more frequently with virus C than with virus Y. Thus, it occurred in from 21·1 to 34·5 per cent. selected seedlings with respect to virus C, and in only 4 to 14·7 per cent. with respect to virus Y. Hypersensitivity is suggested to be due to a recessive condition, its less frequent occurrence with respect to virus Y being due to different localizing genes.

JENSEN (J. H.) & TATE (H. D.). **Aster yellows and its vector on Potatoes in Nebraska.**—*Phytopathology*, xxxvii, 1, pp. 69–71, 1947.

The occurrence in Nebraska both of the aster-yellows virus and its leafhopper vector, *Macrosteles divisus*, suggested the advisability of experiments in 1943 and 1944 to determine the effect of the disease on potatoes [*R.A.M.*, xxii, p. 493; xxiv, p. 406] in the State. Of 56 caged Triumph potato plants exposed to viruliferous leafhoppers during the winter, two developed typical aster-yellows symptoms and

one other was suspected of harbouring the virus after an incubation period of 35 to 40 days. Three out of seven asters exposed to leafhoppers collected in commercial potato plantings in the summer of 1944 also contracted infection, but negative results were given by similar tests on potatoes. Collections of *M. divisus* made in potato fields at two to seven-day intervals from 14th July to 4th October, 1943, supplemented by numerous observations in the same area from 1940 to 1945, inclusive, indicate that the leafhopper does not become abundant on potatoes until the plants have reached maturity in early August.

It is concluded that cropping practices and climatic conditions in western Nebraska do not favour the development of aster yellows on potatoes.

DAVIDSON (R. S.) & RICH (A. E.). **The performance of new fungicides for controlling late blight on Potatoes.**—*Amer. Potato J.*, xxiv, 2, pp. 35–39, 1947.

Field trials made during 1945 and 1946 on Green Mountain potatoes at Kingston, Rhode Island, to compare Bordeaux mixture with organic fungicidal sprays against late blight (*Phytophthora infestans*) showed that in 1945 Bordeaux mixture (eight weekly applications at 10–10–100) gave the best control of the disease, the crops yielding an average of 228 bush. per acre (87 per cent. No. 1 potatoes), phygon (2 lb.–100) being next with 172, the unsprayed plots giving 118 bush. per acre. In 1946 Bordeaux (11 weekly applications at 8–4–100) again gave the best average yield of 404 bush. per acre (93 per cent.), then tribasic copper (4–100), zerlate (2–100), and phygon ($\frac{1}{2}$–100), giving 329, 282, and 278 bush. per acre, respectively. In 1945 Bordeaux was significantly better than any of the other 12 materials tested; in 1946 tribasic copper, zerlate, phygon, and methane G. 11 were also significantly better than the control treatments. Only Bordeaux and tribasic copper (in 1946 only) prevented any increase in late blight after the last spray application.

TAYLOR (C. F.) & DECKER (P.). **A correlation between pathogenicity and cultural characteristics in the genus Actinomyces.**—*Phytopathology*, xxxvii, 1, pp. 49–58, 1947.

Of 143 isolates used in studies at Cornell University, Ithaca, New York, on the physiological characters of *Actinomyces* in relation to pathogenicity to potato tubers [*R.A.M.*, vi, p. 179; xvii, p. 198], 110 were obtained in the neighbourhood between 1930 and 1934 from scabbed potato tubers, 8 from beets [ibid., vii, p. 137 *et passim*], 3 from radishes [ibid., xiv, p. 340; xxiv, p. 401], 11 from different local sources, and 22 were procured from other laboratories or indirectly through type-culture collections. Most of the local strains were isolated by Taylor's method [ibid., xv, p. 604].

Goss's procedures for testing the pathogenicity of *A. scabies* isolates on potatoes [ibid., xvii, p. 199] were followed with several major adaptations. The experiments were conducted in a greenhouse with a temperature range from 20° to 30° C. on scab-free, formalin-treated, sprouted Green Mountain or Irish Cobbler seed pieces, which were inoculated, together with the surrounding loam-peat soil in the upper 3 in. of 6-in. pots, with an aqueous suspension of the pathogen from potato dextrose agar cultures incubated at 20° for 10 to 21 days.

Within the group investigated, the capacity to produce typical scab lesions was correlated perfectly with the formation of a dark brown ring of surface growth on separated milk. In inoculation tests with 61 such isolates (all of which were non-acid-fast), 763 out of 1,178 tubers (64·8 per cent.) contracted scab.

Partial acid-fastness in 15 strains was correlated perfectly with non-micro-aerophilic growth. Gelatine was liquefied by all the non-acid-fast isolates and by the two non-micro-aerophilic acid-fast, but not by the 13 micro-aerophilic acid-fast. Succinic, formic, oxalic, and citric acids were the most useful of the 30 carbon

sources tested for the separation of the isolates. Malic acid was the only source utilized by all the strains. All the isolates produced ammonia and no indole under the experimental conditions. All made good growth at 32°, 9 failed to develop at 35°, 101 grew at 35° but not at 40°, and 25° at 40° but not at 42°; two of the eight isolates tolerating a temperature of 42° were still capable of growth at 46°, which appeared to be near the upper limit. One of the local strains, No. 7, approximated closely to No. 3502, supplied by the culture collection at Baarn as Wollenweber's *A. tricolor* [ibid., i, p. 183]. Both were apparently identical with the species described earlier by Waksman as *A. violaceus-ruber*. A key is furnished to the isolates studied, based on bacteriological tests.

An atypical, superficial russeting of the tubers was associated with inoculation by certain otherwise non-pathogenic isolates, but the etiological nature of the relationship is not regarded as proved.

MAGROU (J.). **Facteurs biologiques et physicochimiques de la tubérisation chez la Pomme de terre (Solanum tuberosum L.).** [Biological and physico-chemical factors in the tuberization of the Potato (*Solanum tuberosum* L.).]—*Ann. Sci. nat.*, *Bot.*, Sér. XI, iv, pp. 97–102, 4 pl., 1 fig., 1943. [Received April, 1947.]

The author states that when potato plants were grown from seeds in unfertilized soil side by side with bitter-sweet [*Solanum dulcamara*], some became infected by the symbiotic mycorrhizal fungus of the latter. The infected potatoes formed tubers, the resistant ones did not [cf. *R.A.M.*, xxvi, p. 164]. Observations showed that [potato] seedlings transplanted into uncultivated land in which plants [unspecified] with mycorrhiza were abundant developed endotrophic mycorrhiza. This occurred even when none of the associated plants belonged to the Solanaceae. A correlation was established between potato tuberization and the presence of mycorrhiza. Some potatoes resisted infection by destroying the fungus in the tissues of their rootlets by means of a phagocytic process.

In a sterile medium, tuberization occurred when the nutritive medium reached a certain critical osmotic tension. The fungi, by converting starch into sugar, merely cause, in a soil not containing fertilizer, this critical figure to be exceeded. In normal conditions of cultivation, where mycorrhiza are generally absent, tuberization is probably due to the high osmotic tension resulting from the application of manure.

BANDEMER (SELMA L.), SCHAIBLE (P. J.), & WHEELER (E. J.). **Discoloration of Potatoes after cooking as related to their composition.**—*Amer. Potato J.*, xxiv, 1, pp. 1–6, 1947.

When the values for moisture, ash, manganese, iron, and pH were determined for Sebago, Chippewa, Green Mountain, and Russet Rural potatoes grown in Michigan and were correlated with the degree of discoloration after steaming [cf. *R.A.M.*, xxiv, pp. 33, 358; xxv, p. 576] it appeared that the correlations between discoloration and moisture, moisture and pH, and between all three were all highly significant within lots from the same grower. Discoloration increased with increasing moisture and decreasing pH. Moisture content appears to be a dominant factor exercising an influence on some more directly involved component.

RYKER (T. C.). **New pathogenic races of Cercospora oryzae affecting Rice.**—Abs. in *Phytopathology*, xxxvii, 1, pp. 19–20, 1947.

Attempts are in progress to control rice leaf spot (*Cercospora oryzae*), the most serious disease of the crop in Louisiana, through the breeding of resistant strains. Of the mid-season and late varieties, Blue Rose has been classified as susceptible, and Rexoro, Fortuna, and Nira as resistant. Race 4 [*R.A.M.*, xxiii, p. 499],

attacking only Fortuna, was reported in 1940 but has not multiplied to any appreciable extent. In 1945, however, several diseased fields of Fortuna were observed, and by 1946 the number had increased. Tests on the six differential varieties indicated the presence on the infected plants of a new race (7), to which Blue Rose was susceptible as well as Fortuna. Since 1944, Rexoro has sustained severe damage in a widespread outbreak of race 6 [ibid., xxvi, p. 124]. The sole remaining resistant variety, Nira, showed some infection in 1945 and more in 1946 due to yet another new race, designated 8. Besides Nira, Fortuna was susceptible, while Blue Rose, Blue Rose 41, Caloro, and Rexoro were resistant in inoculation tests.

Sharp (C. C. T.), De Silva (C. A.), & Ford (C. E.). **Botanical and Mycological Department.**—*Rep. Rubb. Res. Bd Ceylon, 1945*, pp. 14–18, 1946.

In this report [cf. *R.A.M.*, xxiv, p. 203] it is stated that during 1945, in contrast to 1944, *Oidium* leaf disease of rubber [*O. heveae*: ibid., xxv, p. 183] was very light in all parts of Ceylon, the new foliage being the healthiest for many years. Hot, dry weather had favoured early wintering and quick refoliation. At Dartonfield a sharp attack affecting a few late-wintering trees and clones occurred towards the end of February after light showers. Leaf and pod disease were also very mild.

An abnormal form of bark canker of untapped budded trees in the Kalutara district first showed as vertical cracks in the bark, generally near the base. A fungus, believed to be a *Phytophthora* [cf. ibid., xxiv, p. 385], had spread through the inner cortex for a distance, in some cases, of over 1 ft. As a rule, most of the affected tissue lay under apparently healthy bark. Similar symptoms were noted on one other estate in the vicinity and on some trees at Dartonfield. All the affected trees were in damp situations.

Mungomery (R. W.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1945–46*, pp. 31–38, 1946.

In this report [cf. *R.A.M.*, xxv, p. 277] it is stated that the Mossman mill area in the far north of Queensland is the only part of the State where gumming disease (*Bacterium* [*Xanthomonas*] *vasculorum*) [loc. cit.] is known to occur in commercial sugar-cane crops. During the period under review eleven farms were found to be affected. Every effort was made to expedite the propagation of resistant varieties. It is not expected that it will be possible to confine the disease indefinitely to the area at present affected, and, in the long run, control must depend on a large-scale change of varieties. A quarantine was proclaimed before the 1946 planting season which prohibited the planting of S.J. 4 and Clark's Seedling (H.Q. 426) and the removal of any cane from the area except for milling. The area quarantined included the cane-growing lands of Rocky Point, Bamboo Creek, Miallo, and Syndicate, and involved 74 farms.

The only parts of Queensland where downy mildew (*Sclerospora sacchari*) [loc. cit.] was present were Mossman and Bundaberg. At Mossman, nine fields on four farms in the Miallo area along Saltwater Creek showed the disease. Some 50 acres were affected, but except in two fields damaged by flood in 1945, infection was light. In the Bundaberg district, the disease was again confined almost entirely to the red volcanic soils of the Woongarra. About 19 affected stools were found on three farms at South Kalkie on a different soil, but 4,901 were rogued on the Woongarra, an increase of 3,602 over 1944–5. The efforts of the Cane Pest and Disease Control Board in the Bundaberg area have permitted the retention of P.O.J. 2878, and it would seem that in normal years an equilibrium had been reached between the roguings and the spread of the disease. Weather conditions in 1946 were, however, unusual and caused a sudden increase in the number of affected stools. Efforts at control were materially assisted by a return to drought conditions later. The downy mildew resistance trial in the Cairns area included seedlings from the

Northern and Central Experiment Stations, in addition to named canes and five [*Saccharum*] *robustum* varieties from New Guinea.

Results of stool counts showed no infection on E. 122, E. 240, E. 269, E. 283, 28 N.G. 289, and S.J. 4, and 0·1 per cent. infection on D. 104, D. 220, E. 120, E. 121, E. 134, E. 208, E. 209, E. 214, E. 225, E. 245, E. 249, E. 275, E. 276, 28 N.G. 251, Badila, Q. 813, and Toledo. The 28 N.G. 289 cane showed no infection in 33 stools, 28 N.G. 251 one infected stool in 32, 28 N.G. 218 8 in 40, 28 N.G. 253 4 in 21, while 28 N.G. 82 was very susceptible, with 20 affected stools in 38. The resistance trial in the Bundaberg district included only Bundaberg seedlings and standards; stalk counts showed no infection on M. 1900 Sdg.

In the Bundaberg district, 3,988 stools with Fiji disease [loc. cit.] were rogued from 24,657 acres inspected, 231 stools from the quarantined areas at Tantitha and Avondale and 3,757 from the rest of the district. New infections were found on 24 farms near Bundaberg, most of which were in the path of natural spread from affected properties. In the Isis area 49 affected stools were found on five farms. In the Maryborough–Bauple district, from the Dundowran–Nikenbah area 81 on six farms, and one each at Tinana, Mungar, and Granville, made a total of 84 affected stools compared with 72 in 1944–5. No Fiji disease was seen in the Bauple area. In the Moreton area the disease was present almost everywhere, 11,000 affected stools being found. In the Rocky Point mill area where about 15,000 tons of cane are harvested annually, Fiji disease was present in threatening amounts in P.O.J. 2878 and, to a rather less extent, in C.P. 29/116. Most of the cane in this locality is the resistance Co. 290.

As a minimum period of nearly two years must elapse, in a trial of varietal resistance to Fiji disease, between planting and the time when its reaction to the disease becomes known, an exploratory test was conducted in a glasshouse in Brisbane to ascertain if this period could be shortened. The house was gauzed on one side, was well ventilated, but proofed against flying insects. Commercial varieties of sugar-cane were grown in tubs in the house and inoculated at a suitable stage by the leafhopper vector *Perkinsiella saccharicida.* A satisfactory amount of disease appeared, and there appears to be no reason why a trial should not be completed in a suitable glasshouse in six months from the date of planting the setts. Further studies on transmission by *P. saccharicida* indicated that infective nymphs can transmit the disease in a 20-hour feeding period on healthy cane. They can remain infective for at least 16 days after removal from diseased cane. Infective nymphs transmitted the disease to healthy cane through the young rolled spindle, mature leaves, and the leaf sheath. The shortest period required for disease symptoms to appear after infective hoppers were caged on the plants was 29 days under good growing conditions, periods up to 236 days being required when the plants were stunted and poor.

Leaf scald (*Bact.* [*X.*] *albilineans*) [loc. cit.] occurs only in small amounts in the far northern mill areas, but potentially it is important, because the new varieties Q. 44 and Trojan are susceptible. A survey in the Herbert River area in 1945 showed approximately 1,100 acres of Trojan of 6,019 inspected to be affected. Most of the infection was found on farms where diseased Trojan had been planted, but 14 farms were newly infected. Approximately 500 tons of cane were lost because of the disease in 1945, and the estimated figure for 1946 was 2,000 tons. In a varietal resistance trial, Eros D. 1135 and 32–8560 [cf. loc. cit.] developed no leaf scald, while Trojan and Q. 44 were less affected than H.Q. 426 and Mahona. Cultures of *X. albilineans* retained their pathogenicity for at least 18 months.

Chlorotic streak [loc. cit.], severe in the Moreton Mill area, was recorded on the new canes Q. 28, Q. 42, Q. 49, Akbar, Solon, and Vesta for the first time there. C.P. 29/116 and P.O.J. 2878 were also attacked. The disease was also observed on P.O.J. 2878 in the Rocky Point mill area, the first Queensland record south of

Brisbane; it appears to be well established in New South Wales, just south of the Queensland border.

Dwarf disease [ibid., xx, p. 231] was found on 21 farms in the Mackay area. Red rot [*Physalospora tucumanensis*: ibid., xxv, p. 278] was prevalent in all varieties in the Mackay area during the winter as a result of dry weather conditions. It was also present in the drought-affected Bundaberg district, but appears to have caused most damage on Co. 290 in the Moreton mill area. Q. 28 appeared to be unaffected, and hopes are entertained that this variety will replace much of the susceptible Co. 290. Low temperatures in late autumn and winter resulted in widespread attacks of pineapple disease [*Ceratostomella paradoxa*: ibid., xxii, p. 453; xxv, p. 279] in the newly planted cane in the irrigated Burdekin district.

Dufrénoy (J.). **Nouvelles utilisations de la Canne à Sucre et maladie du 'chlorotic streak'.** [New uses for Sugar-cane and chlorotic streak disease.]—*Rev. Bot. appl.*, xxvi, 289–290, pp. 647–650, 1946.

Referring to the presence of pyridoxin (vitamin B_6) in sugar-cane and the method for detecting its presence, the author states that the distribution of this substance in the cane is markedly affected by chlorotic streak disease [*R.A.M.*, xxiv, p. 291]. If an apparently affected cane is split longitudinally, red stripes marking the position of the vascular bundles are usually found at the nodes. Bright, spherical bodies can be seen microscopically floating in the cell vacuoles; these spheres are distinctly delimited by a membrane and are very resistant, they can be removed from the cells without change of shape. They have been shown by the author to result from coacervation [cf. ibid., xxi, p. 536]. Physically, coacervation is intermediate between precipitation and crystallization. Pyridoxin, normally dispersed in the vacuolar solution, becomes condensed into a ball, floating in the watery vacuolar fluid. It becomes surrounded with a membrane composed of phosphatides and forms a very stable 'coacervate auto complex'. These coacervates are not diagnostic of chlorotic streak, as they are also found near red rot (*Physalospora tucumanensis*) lesions [ibid., xxiv, p. 338], and, occasionally, in older tissues of apparently healthy cane.

Hansford (C. G.). **The foliicolous Ascomycetes, their parasites and associated fungi.**—*Mycol. Pap., Imp. mycol. Inst.*, 15, 240 pp., 75 figs., 1946. 18*s*. net.

This annotated list of the foliicolous Ascomycetes, their parasites and associated fungi, especially as illustrated by Uganda specimens, is based on sixteen years' study of collections made by the author in Uganda, supplemented from parallel collections made by F. C. Deighton in West Africa.

The distinction between fungi which are (1) directly parasitic on leaves, (2) purely superficial and hence presumably saprophytic in habit, or (3) entirely parasitic on other fungi ('hyperparasites') is considered to be fundamental. When this basic distinction was applied to the forms studied it became evident that much revision of previous classifications would be necessary in order to avoid separating closely related forms. The diagnostic criteria used in the new classification are based on the nature of the host whether leaf or fungus, the method of development and absorption of nutriment, and the development and structure of the fructification. The author has endeavoured to reduce the confusion that has resulted from the difficulty of distinguishing between mixed colonies of hyperparasites and between hyperparasite and fungus host. The majority of the leaf Ascomycetes are classified into three orders: the Myriangiales, Sphaeriales, and Microthyriales. In addition there are a few Discomycetes which are placed in the Helotiales and Agyriales.

The Myriangiales (pp. 5–33) includes those families in which the 'dothidial' type of ascoma predominates. It represents the development of ectoparasitism, culminating in the entirely ectoparasitic Meliolaceae, and of separate unilocular

perithecia from the undifferentiated immersed stroma of the Myriangiaceae. The families Parodiellinaceae and Meliolaceae are treated in detail and working keys to the genera are provided, but the detailed study of the Meliolineae is deferred for later publication. The Dothidiaceae, Montagnellaceae, and Erysiphaceae are also included in this order.

The order Sphaeriales (pp. 33–159) is characterized by unilocular perithecia with a definite wall and apical pore and by a superficial mycelium without hyphopodia. The separate, superficial, external perithecia in the Sphaeriaceae become in other families immersed in the host either singly or aggregated into more or less completely immersed stromata. The Sphaeriaceae is provided with a key to the foliicolous genera (63 in number, including 4 new) having distinctions based primarily on colour and septation of the ascospores, and secondarily on the nature of the perithecia and of the parasitism (leaf or hyperparasite). For some of the genera species keys are provided. The members of the Hypocreaceae studied are hyperparasites of *Meliola* and *Asterina*; a species key is provided, the distinctions between them being based on spore morphology and dimensions and the presence or absence of perithecial setae. A common key is used for the genera *Calonectria* and *Nectria*. In the Chaetothyriaceae the author has grouped all forms (with a key to the genera) which show affinity with *Chaetothyrium guaraniticium*. The remaining families grouped in this order, viz., Mycosphaerellaceae, Gnomoniaceae, Valsaceae, Phyllachoraceae, Capnodiaceae, and Coryneliaceae are not treated in detail.

The order Microthyriales (pp. 159–199) is distinguished from the preceding order by the radiate character of the upper wall of the flattened ascoma (thyriothecium). Again there appears to be a gradual development towards extreme ectoparasitism. Generic keys, based primarily on the colour and septation of the spores and the morphology of the ascomata, are given for the families Stigmateaceae, Microthyriaceae, and Asterinaceae n. fam. The remaining families Trichothyriaceae, Trichopeltacae, and Hemisphaeriaceae are not treated in detail. In the Asterinaceae are gathered the extreme leaf ectoparasites having specialized hypopodia rarely penetrating deeper than the epidermis.

In part II (pp. 200–222) the hyperparasitic members of five families of the Fungi Imperfecti are described. Host and fungus indexes are appended. [New genera and species are listed in *R.A.M.*, supplement 13, 1946.]

PADWICK (G. W.). & KHAN (A.). **Notes on Indian fungi. II.**—*Mycol. Pap., Imp. mycol. Inst.*, 10, 17 pp., 10 figs., 1944. 3*s*. net.

This second contribution to the present series [*R.A.M.*, xxiii, p. 151] comprises 22 species of Indian smuts and rusts. Of the four new species erected mention may be made of *Ustilago morinae* n. sp. on flowers of *Morina longifolia*. As a result of investigations into spore germination the authors propose *Neovossia horrida* as a new combination for *Tilletia horrida* on rice. *Puccinia himalensis* on the basis of uredospore and teleutospore morphology and dimensions is considered to be a species distinct from *P. coronata*.

PADWICK (G. W.). **Notes on Indian fungi. III.**—*Mycol. Pap., Imp. mycol. Inst.*, 12, 15 pp., 11 figs., 1945. 3*s*. net.

In this third contribution to the present series [see preceding abstract] 25 species (four new) are described, including *Synchytrium gei* n. sp. on leaves and petioles of *Geum elatum*, *Catacauma himalayanum* n. sp. on leaves of *Ficus faveolatus*, and *Fusarium brachygibbosum* n. sp. on sorghum. *Darluca filum* was encountered frequently on rusts which, in some cases, it had almost destroyed, all uredosori being infected [cf. *R.A.M.*, xxiv, p. 476]. Other interesting citations are *Septoria petroselini* on parsley, *Fusarium udum* var. *crotalariae* from wilted *Crotalaria medicaginea* var. *neglecta*, *F. solani* var. *minus*, a virulent pathogen causing severe

rotting of immature potato tubers, and *Coniothecium chomatosporum* causing the death of many apple-trees over large areas near Srinagar and at Sopore [ibid., xxiii, p. 393].

PADWICK (G. W.). **Notes on Indian fungi. IV.**—*Mycol. Pap., Imp. mycol. Inst.*, 17, 12 pp., 10 figs., 1946. 3*s*. net.

This further contribution to the present series [see preceding abstracts] comprises 27 species (three new), including *Ustilago vetiveriae* n. sp. in inflorescences of *Vetiveria zizanoides*, *U. bothriochloae-intermediae* n. sp. in inflorescences of *Bothriochloa intermedia*, and *Sorosporium digitariae* n. comb. (syn. *Sphacelotheca digitariae*) causing smut of *Panicum repens*.

MUNDKUR (B. B.) & THIRUMALACHAR (M. J.). **Revisions of and additions to Indian fungi. I.**—*Mycol. Pap., Imp. mycol. Inst.*, 16, 27 pp., 19 figs., 1946. 3*s*. 9*d*. net.

This is the first of a series of papers giving accounts of fungi that are new records for India or new species and such additional information on those recorded by Butler and Bisby [*R.A.M.*, xi, p. 545] or Mundkur [ibid., xviii, p. 57] as may become available. In this part there are 14 new species, including *Scopella fici* on *Ficus* sp. leaves, *Puccinia operta* (the teleutospore stage of *Uredo operta*) on *Coix lacryma-jobi*, *P. allii-cepulae* on onion, *Ravenelia acaciae-arabicae* on *Acacia arabica* and *R. berkeleyi* on *Cassia absus*; three new combinations, including *Melanopsichium eleusinis* (syn. *Ustilago eleusinis* [ibid., xviii, p. 628]) on *Eleusine coracana* and *Sphacelotheca bursa* (syn. *Ustilago bursa*) in ovaries of *Anthistiria ciliata* and other spp.; and 12 new records, including *P. eremuri* on *Eremurus himalaicus*, *P. megatherium* on *Gagea reticulata*, *P. abutili* on *Abutilon indicum*, *P. erebia* on *Clerodendron inerme*, *R. albizziae-amarae* on *Albizzia amara*, *Cercospora paneratii* on *Crinum*(?) *asiaticum*, and *Pestalotia menezesiana* which, together with *Phakopsora vitis*, causes considerable damage to vines by hastening defoliation.

MUNDKUR (B. B.) & AHMAD (S.). **Revisions of and additions to Indian fungi. II.**—*Mycol. Pap., Imp. mycol. Inst.*, 18, 11 pp., 8 figs., 1946. 3*s*. net.

This second contribution to the present series [see preceding abstract] comprises 40 species, of which 8 are new and 30 are new records for India, including *Peronospora spinaciae* [*P. effusa*] on spinach, *Linospora ochracea* on apple leaves, *Cercospora anonae* on leaves of *Annona squamosa*, *C. canavaliae* on leaves of *Canavalia ensiformis*, *C. citrullina* on water-melon leaves, *C. corchorica* on jute leaves, *C. jasminicola* on leaves of *Jasminum* spp., *C. mali* on apple leaves, *C. physalidis* on leaves of *Physalis minima*, *C. zizyphi* on leaves of *Ziziphus nummularia*, *Chlamydomyces palmarum* on leaves of cardamom, *Piper longum*, and *Rubus lasiocarpus*, and *Oidium lini* on flax.

DE SOUSA DA CAMARA (E.) & BRANQUINHO DE OLIVEIRA (A. L.). **Contributio fungorum minima in Lusitania collectorum. Ustilaginales. I.** [A small contribution of fungi collected in Portugal. Ustilaginales. I.]—*Lusit. agron.*, vii, 2, pp. 101–108, 1945.

This annotated list of 17 Portuguese Ustilaginales includes *Urocystis tritici* on wheat, *Ustilago levis* [*U. kolleri*] on oats, *U. perennans* on *Arrhenatherum elatius* [*A. avenaceum*: *R.A.M.*, xxiii, pp. 170, 475], *Sphacelotheca schweinfurthiana* on *Imperata cylindrica* [ibid., xvii, p. 270], and *S. sorghi* on sorghum.

SĂVULESCU (T.). **Einige neue Micromyceten.** [Some new Micromycetes.]—*Bull. Sect. sci. Acad. roum.*, xxv, pp. 22–30, 9 figs., 1943. [Received February, 1947.]

Latin diagnoses are given of four new species of Micromycetes collected by the author in Rumania, including *Cercosporella dictamni* on *Dictamnus albus*, *Macrosporium carthami* on safflower [*R.A.M.*, xix, p. 166], and *Epicoccum yuccae* on *Yucca filamentosa*.

M. carthami produces on both sides of safflower leaves roughly spherical or irregular, scattered, later confluent, pale chestnut or brown to ferruginous, white-centred lesions, the paler margins often raised, 3 to 5 mm. in diameter; the solitary or fasciculate conidiophores are simple, erect, cylindrical or flexuose, often with a nodular swelling at the base, uni- to triseptate, olivaceous, paler at the slightly thickened tip, 30 to 100 by 6 to 10, mostly 45 to 60 by 7·5 μ; the acrogenous, ellipsoid, ovoid, piriform, claviform, or elongated, brown to olivaceous conidia measure 70 to 115 by 15 to 21 (75 to 90 by 15 to 18) μ and are furnished with 7 to 16 transverse and 1 to 2 longitudinal septa.

E. yuccae forms on *Yucca filamentosa* leaves ash-coloured, elliptical, elongated spots, 1 to 3 by 0·5 cm., surrounded by a ferruginous margin; the sporodochia are epiphyllous, punctiform, gregarious, confluent, pulveraceous, intensely black; the hemispherical stroma, 26·5 to 40 by 13 to 26·5 μ, pale olivaceous within, brown to fuscous externally, consists of dense polyhedral cells; the conidia are globose, obovoid or piriform, sessile or furnished with a very short, hyaline pedicel, brown, multicellular, granular-verrucose, and measure 13·2 to 23·1 by 11·35 to 19·8 (19·8 by 16·5) μ. The fungus causes desiccation and slitting of the foliage, on which it is succeeded by *Cladosporium herbarum*. Comparative notes are given on the related species, *E. neglectum* [ibid., xvi, p. 491], *E. granulatum*, *E. nigrum*, *E. vulgare*, and *E. purpurascens* [ibid., xix, p. 601].

VERPLANCKE (G.). **Addenda à la flore mycologique belge.** [Addenda to the Belgian mycological flora.]—*Ann. Soc. sci. Brux.*, Sér. 2, lx, 1, pp. 29–36, 1940. [Received April, 1947.]

Included in this annotated list of 59 fungi not hitherto recorded for Belgium are *Puccinia apii* on celery, *Melampsora euonymi-capraeacearum* on *Euonymus europaeus*, and *Ceratostomella pilifera* and *Cucurbitaria pithyophila* [*R.A.M.*, xvii, p. 493] on pine (*Pinus sylvestris*).

SHERBAKOFF (C. D.). **Plant-disease relation and classification of Fusaria.**—Abs. in *Phytopathology*, xxxvii, 1, pp. 20–21, 1947.

The identity of species of *Fusarium* [*R.A.M.*, xxvi, p. 218] is of great moment to plant pathologists. The author [ibid., iv, p. 705; xxiii, p. 410] upholds Wollenweber's system of classification with the following reservations. Parasitic species should retain their original binomials, e.g., *Fusarium lycopersici*, the 'form' being used only in the case of physiological departures from the type. Other species should be determined on the basis of their macroconidia in optimal development, supplemented by the distinctive features of their microconidia, conidiophores, chlamydospores, and so forth. No single character alone could hold throughout in any system of classification, and no overlapping of its extremes invalidates a character. Under these rules a name like *F. roseum* f. *cerealis* Snyder and Hansen [ibid., xix, p. 495] could not be devised. Notwithstanding the differences in their behaviour under divergent environmental conditions, the alleged great variability of *F.* spp. is more imaginary than real. The classification of the genus would be much facilitated by knowledge of methods for obtaining optimal sporulation, and by good photographs.

SIGURGEIRSSON (T.) & STANLEY (W. M.). **Electron microscope studies on Tobacco-mosaic virus.**—*Phytopathology*, xxxvii, 1, pp. 26–38, 6 figs., 5 graphs, 1947.

Electron micrographs, prepared by the shadow-casting technique [*R.A.M.*, xxv, p. 437], of the freshly expressed juice of Turkish tobacco-plants infected by the tobacco-mosaic virus, showed most of the rod-shaped particles to measure 280 by 15 mμ. On standing at 4° C. many of these particles in the juice join end-to-end to form longer ones up to 1,500 mμ. At the end of one day a significant increase in

the number of double-length particles was apparent, and after 20 days they exceeded those near 280 mμ long. The joints founded by the end-to-end union of particles appeared to be equally strong mechanically with those in other positions along the rods. Some of the elongated particles seem to be broken up by thermal or mechanical stresses into rods of variable shorter lengths, of which those shorter than 280 mμ are apparently devoid of virus activity.

These results corroborate the assumption [ibid., xx, p. 428] that the basic infective unit of the tobacco-mosaic virus measures 280 by 15 mμ.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **An electron microscope study of mutation in Tobacco-mosaic virus.**—*Phytopathology*, xxxvii, 2, pp. 73–76, 1 fig., 1 graph, 1947.

A comparative study with the electron microscope of the tobacco-mosaic virus [see preceding abstract] and a yellow mutant isolated from it [*R.A.M.*, xiii, p. 330] revealed no differences in shape or size. It is concluded from these results, combined with the evidence presented by Knight in connexion with the rib-grass [*Plantago lanceolata*] strain of tobacco mosaic [ibid., xxii, p. 44] and Knight and Stanley concerning cucumber virus 4 [cucumber green-mottle mosaic virus] (*J. biol. Chem.*, cxli, pp. 29–38, 1941), that mutations of rod-shaped viruses are not ordinarily accompanied by a modification of the particle of sufficient magnitude to be detected by the electron microscope. It follows, therefore, that an unidentified virus and a known rod-shaped one of the same particle size are in all probability related.

GRAHAM (T. W.), CLAYTON (E. E.), GAINES (J. G.), SMITH (T. E.), & TODD (F. A.). **Organic compounds for control of Tobacco blue mold.**—*Phytopathology*, xxxvii, 2, pp. 125–138, 3 figs., 1947.

Over 250 organic toxicants and other substances were tested for the control of tobacco blue mold (*Peronospora tabacina*) in greenhouse and plant beds from 1941 to 1946, inclusive, at Pee Dee Experiment Station, South Carolina. Large-scale supplementary plant-bed tests were further conducted at Coastal Plain Experiment Station, Tifton, Georgia, and two North Carolina branch stations [cf. *R.A.M.*, xxii, p. 410], Bismuth subsalicylate proved outstandingly and consistently effective, both as a spray ($1\frac{1}{2}$ lb. per 100 gals.) and dust, applied at a dosage of 10 to 15 per 100 lb., with pyrophyllite (pyrax ABB) as diluent, while benzyl salicylate (1 lb.), acetylsalicylic acid ($\frac{1}{4}$ lb.), salicylamide ($1\frac{1}{2}$ lb.), salicylic acid ($\frac{1}{2}$ lb.), and sodium salicylate ($\frac{1}{2}$ lb.) gave better control than copper oxide-cottonseed oil (1 lb.: 1 gal.). Certain derivatives of benzoic acid, notably benzoyl peroxide (1 lb. per 100 gals.), were toxic to *P. tabacina*. Both as a spray (4 lb. per 100 gals.) and in dust form (10 to 15 per 100 lb.), fermate showed a high degree of efficiency. Tests with this compound in 1944, however, showed that relatively large quantities of dust (17 to 20 lb. per 100 sq. yds. bed area throughout the season) and thorough coverage are essential to the success of the treatment. In a limited number of tests dithane D-14 (2 qts. per 100 gals. plus 1 lb. zinc sulphate and $\frac{1}{2}$ lb. hydrated lime) reduced the incidence of infection within tolerable limits. Combinations of zinc salicylate (2 lb.) with fermate, spergon, and thiosan, at 15, 10, and 10 lb., respectively per 100 lb. dust, were more effective than any of the components alone. Marked residual protection was conferred by spraying or dusting with bismuth subsalicylate, or by dusting with combinations of zinc salicylate with fermate or thiosan.

N.J. Stations reports on controlling Tomato blight.—*Food Packer*, xxvii, 11, p. 76, 1946.

On 5th July, 1946, three days after the detection of the first symptoms of tomato late blight [*Phytophthora infestans*: *R.A.M.*, xxvi, p. 220 and next abstract], B. H. Davis, of the New Jersey Agricultural Experiment Station, instituted a control

programme on a Monmouth County farm. An insoluble copper (50 per cent. metallic copper), applied six times at 10-day intervals at the rate of 4 lb. in 100 gals. water, 150 gals. per acre, resulted in the first three pickings from 100 treated plants yielding only 12 green and ripe fruits destroyed by the fungus, whereas over 2,600 were infected on 100 untreated controls. By the end of August the sprayed areas had produced twice as much marketable fruit as the untreated, while many healthy tomatoes remained for later picking. Late blight is also controllable by the application of a copper dust containing not less than 6 per cent. copper and used at the rate of 40 lb. per acre.

SMITH (C. L.). **Controlling Tomato late blight.**—*Food Packer*, xxvii, 13, p. 70, 1946.

Tomato late blight [*Phytophthora infestans*] appeared in the autumn of 1945 and early spring of 1946 in Florida and extended slowly northwards, involving all the eastern seaboard States and spreading as far west as Indiana [*R.A.M.*, xxvi, p. 176]. Many growers are now considering the advisability of including tomatoes in the group of crops sprayed regularly as 'insurance', and with this question in mind inquiries were put by the Agricultural Insecticide and Fungicide Association to the plant pathologists in several States and a leading canner.

From Delaware J. W. Heuberger replied that the loss amounted to half the potential yield. The yields of the canning company which had 80 per cent. of its contracted acreage dusted by aeroplane from one to seven times averaged double those of the untreated fields. Some growers who dusted seven times with a neutral copper secured a yield of 17 tons per acre, while others using a dithiocarbamate or neutral copper obtained 20 tons in areas where the untreated fields produced less than 5 tons per acre. It is estimated that 10 per cent. of growers with 15 per cent. of the acreage attempted control.

In Pennsylvania, according to H. W. Thurston, late blight was effectively combated by spraying with Bordeaux mixture 6–3–100 or 8–4–100 or with fixed coppers at equivalent copper dosages.

W. T. Schroeder states that excellent results were obtained at Geneva, New York, with a five-treatment schedule alternating two coppers and three dithiocarbamates. Both in 1945 and 1946 diseased tomato plants appeared early in proximity to severely infected 'volunteer' potatoes.

BRETZ (T. W.) & SWINGLE (R. U.). **Known distribution of phloem necrosis of the American Elm.**—*Plant Dis. Reptr*, xxx, 5, pp. 156–159, 1 map, 1946. [Mimeographed.]

The distribution of phloem necrosis of the American elm [*R.A.M.*, xxv, p. 283; xxvi, p. 47] is summarized as follows: parts of Ohio, Indiana, Illinois, Missouri, Iowa, Nebraska, Kansas, Oklahoma, Arkansas, Mississippi, Tennessee, Kentucky, and West Virginia.

FATE (L. R.), DIKE (C. E.), & LIMING (O. N.). **Culture techniques for large numbers of diseased and dead wood specimens.**—Abs. in *Phytopathology*, xxxvii, 1, p. 7, 1947.

Standard techniques have been modified and new ones developed for the daily handling of several hundred specimens in the Dutch Elm Disease Identification Laboratory. Specimens from diseased but living parts of elm trees infected by *Ceratostomella ulmi* or other vascular parasites are cultured on a simplified potato sucrose agar medium for three days at 50° F. and a further three at room temperature. Dead wood and bark material are cultured by a wet-plate technique, using excess water and low-temperature incubation for 21 days and room temperature for three. Low temperature inhibits the growth of most other organisms during the development of *C. ulmi*, while the subsequent rise, promoting coremial maturation,

is an important step in the procedure. Laboratory contaminations are effectively controlled by the use of antiseptic solutions, the upward direction of air currents, and low-temperature incubation.

MOREAU (C.). **Peuplement fongique de fruits de Diospyros lotus L. et de brous de Juglans regia L. et J. nigra L. tombés sur le sol.** [The fungal population of the fruits of *Diospyros lotus* L. and the shells of *Juglans regia* L. and *J. nigra* L. fallen on the ground.]—*Bull. Soc. linn. Normandie*, Sér. 9, iv, *1944–5*, pp. 58–62, 1946.

The mycoflora of fallen *Diospyros lotus* fruits at the Caen Botanical Garden isolated in pure culture included *Cladosporium herbarum*, *Gloeosporium kaki*, *Botrytis cinerea* [*R.A.M.*, xvi, p. 411], *Mucor mucedo*, *M. hiemalis*, *Penicillium expansum*, and *Fusarium lateritium* [*Gibberella lateritia*], which were followed about six weeks after harvesting by *Acremoniella atra* [ibid., xiv, p. 653] and a new Ascomycete, *Melanospora brevirostrata* n. sp., in association with *Trichothecium roseum*, *Gliocladium roseum*, *Trichoderma koningi*, *Stysanus stemonites* [ibid., xxii, pp. 12, 121], *Sporocybe byssoides*, *S.* sp., *Aspergillus* sp., *Cylindrocarpon* sp., and finally by *Didymium xanthopus*. The mycelium of *M. brevirostrata* forms a fine, whitish network interspersed with amber-yellow to brown bulbils and sometimes with reddish-brown, globular perithecia, surmounted by a short, well-defined beak and uniformly covered by setae.

The mycoflora of walnut (*Juglans regia* and *J. nigra*) husks largely corresponds with the foregoing, but additional species on the former were *F. avenaceum*, another *F.* sp., and *Acrostalagmus lateritius* (Berk.) Moreau [*A. cinnabarinus*], and on the latter *F. sambucinum*. *A. lateritius* develops in profusion below the shell, on the husk.

Previous literature on the mycoflora of walnuts and persimmon (*Diospyros kaki*) is briefly summarized; *D. lotus* does not appear to have been studied from this aspect.

LAIR (EUGENIE D.). **Smooth patch, a bark disease of Oak.**—*J. Elisha Mitchell sci. Soc.*, lxii, 2, pp. 212–220, 12 figs., 1946.

'Smooth patch' affecting the bark of white oak (*Quercus alba*) and post oak (*Q. stellata*) has long been present throughout the deciduous forest regions of the eastern United States. The condition has been observed on the former host in Illinois in association with *Aleurodiscus oakesii* [*R.A.M.*, xii, p. 601] and is very prevalent on both oaks near Durham, North Carolina, where it is associated with a species of *Corticium*.

The lesions were found to enlarge very slowly, the margin advancing radially in one case observed only 2·84 in. in six years. Vertical extension was, however, more rapid. The fungi most frequently isolated from affected bark near Durham were *Trichoderma viride* and a species of *Xylaria*. Eleven others, isolated occasionally, were believed to be of little significance.

Four species were tested for their ability to decompose oak bark blocks *in vitro*. Each was found capable of causing a reduction of weight of the bark, the average percentage decreases being 8 in six months for the *Corticium*, 23·8 in 11 months for *A. oakesii*, 7·6 in nine months for *Xylaria*, and 14·6 in 11 months by *T. viride*. Only the *Corticium*, however, completely enveloped the blocks; the other fungi seemed to be confined to the surface, the bark not being disintegrated in the manner characteristic of smooth patch or as occurred *in vitro* with the *Corticium*.

Microscopic examination of bark invaded by the *Corticium* showed areas of disintegrated cells that appeared as pockets. Some of these pockets were loosely occupied by hyphae interspersed with intact cells. It was ascertained that the *Corticium* could produce acid from pectin and from fats. Lignin was digested, but

cellulose not attacked. Growth was much less vigorous and profuse on media containing black oak (*Q. velutina*) bark than on white oak bark.

The fungus is named *C. maculare* n. sp., and described as follows. Fructifications on bark of living white oaks effuse, thin, adnate, and when mature cracked into minute areolae, 0·33 to 1 mm. in diameter, which flake away from the substratum, on which some white subiculum remains; the margin quickly thinning out, not byssoid; friable when dry; colour cream to dark buff. Entire receptacle about 0·5 to 4 by 0·3 to 1·5 cm., 20 to 170 μ thick, composed of delicate, thin-walled hyphae 1·8 to 3·6 μ in diameter with clamp-connexions and encrusted with mineral matter in the subhymenial zone; no cystidia or gloeocystidia; basidia cuboidal, about 3·6 μ thick, with four long, slender, incurved sterigmata; spores hyaline, 3·5 to 5·5 by 1·8 to 2·8 μ. The fungus is regarded as primary in the production of smooth patch, the other organisms being of secondary importance. This view is based on the following considerations: (*a*) the fungus, locally, is constantly associated with smooth patch lesions, and is never found on normal bark; (*b*) the white pockets of decay produced by the fungus *in vitro* correspond with the type of decay in nature, and are known to be associated with lignin-utilizing fungi; (*c*) the fungus decomposed pectin compounds; examination showed that hyphae were present between the walls of contiguous cells, while intact, free cells occurred in white pocket cavities; (*d*) the fungus utilizes fats *in vitro*, and therefore would be likely to disintegrate suberized tissues. The presence of *A. oakesii* on smooth patch lesions in other areas remains at present unexplained.

VERONA (O.) & FLORENZANO (G.). **Notizie preliminari sopra un disseccamento delle piante di Pioppo.** [Preliminary notes on a wilt of Poplars.]—*Agricoltura ital.*, xlvi (1° N.S.), pp. 299–301, 3 pl., 1946.

During 1946, poplars of several varieties growing in two localities near Pisa (one with very wet, the other with very dry, soil) in plantations six to seven years old became completely withered and defoliated and, according to information received, trees similarly affected had died in two or three years.

Examination of dead and severely affected trees showed that the roots were normal, while the trunk in some cases presented a brown central discoloration which emitted a characteristic odour. Externally, the first and most striking symptom was the presence of brown, wrinkled, more or less regular spots on the shoots. These rapidly enlarged until the whole shoot withered and dried. A year later the withering, proceeding in a basipetal direction, spread to the branches, the bark of which developed characteristic lesions. The affected parts were paler than the healthy ones, and showed extensive cankered areas surrounded by a brown ring. The dead bark bore convex pustules 2 to 3 mm. in diameter, at first covered by the peridium and later, when this was ruptured, forming a greyish zone with a black central pore. The bark, by this time completely disorganized, easily became detached, disclosing the sapwood, which showed a brown discoloration; in some cases, traces of cicatrization callus had formed before the cambium dried. Meantime, the trees were partly or completely defoliated.

Examination of infected material showed the presence of a species of *Cytospora* [cf. *R.A.M.*, xxiv, p. 476], the imperfect state of one of the Valsaceae which was obtained in culture. Further studies are in progress on this fungus which is referred to provisionally as Valsaceae F. 13.

DAY (W. R.). **The leaf scorch of Planes, caused by Gnomonia veneta (Sacc. and Speg.) Kleb.**—*Quart. J. For.*, xli, 1, p. 22, 1947.

Leaf scorch caused by *Gnomonia veneta* [*R.A.M.*, xix, p. 444; xx, p. 611] has occurred every year on planes [*Platanus* spp.] at Oxford for the past 25 years, with very little serious effect. Sometimes, however, many of the smaller twigs are

attacked and die, and are not replaced by a second crop. Trees attacked by this form of twig blight do not, as a rule, recover, though they may linger on with depleted crowns for a long time.

To control the condition, small trees may be sprayed with Bordeaux mixture or some similar fungicide as soon as the buds burst. When large trees are very seriously affected, it is probably best to resort to severe pruning of all the diseased part of the crown, virtually to the extent of pollarding. While extremely severe infection may occur in places from which all dead fallen leaves and twigs have been removed, their destruction is, nevertheless, a precautionary measure which may have value at times.

Oliveira (A. L. F.). **Um fungo parasita do Pinus halepensis, Miller.** [A parasitic fungus on *Pinus halepensis* Miller.]—*Agros*, xxvii, 3–6, pp. 158–164, 5 figs., 1944. [Received 1946.]

The fungus isolated from *Pinus halepensis* affected by die-back in Tapada da Ajuda, Portugal, in 1942 was characterized by subcuticular, erumpent, dark, spherical, ositolate pycnidia, 168 to 240 by 120 to 264 μ, and oblong, elliptical, mostly continuous, hyaline, later dark chestnut pycnospores, which on Dox's medium in turn produced ovoid, septate, thick-walled bodies, 87 by 20·3 μ. Three types of hyphae were observed, viz., (1) hyaline, sparsely septate, rich in protoplasm; (2) stout, with a dark chestnut pigment and granular content; and (3) encrusted or otherwise aberrant. Subcultures from an eight-month-old mycelium made good growth. Potato dextrose agar (2 per cent.) was the best of the media tested. Growth occurred over the wide temperature range of 5° to 35° C., with an optimum at 25°, the most favourable pH lying between 7 and 8. On the basis of these data the fungus was identified as *Diplodia pinea* (= *Sphaeropsis ellisii*) [*R.A.M.*, xxii, p. 412], the systematic position of which is briefly discussed in the light of Grove's studies [ibid., xvii, p. 68].

Positive results were given by inoculation experiments only on wounded plants of the species *P. pinaster*, *P. canariensis*, *P. halepensis*, *P. pinea*, and *P. laricio* [*P. nigra* var. *calabria*], graded in a descending order of susceptibility. *Thuya orientalis* also proved susceptible to *D. pinea*, which further attacked dry wood of *P. sylvestris*, *P. pinea*, and *P. pinaster*, causing discoloration and green streaks; pycnidia appeared on the surface in 18 to 20 days.

Buckland (D. C.). **Investigations of decay in Western Red Cedar in British Columbia.**—*Canad. J. Res.*, Sect. C, xxiv, 5, pp. 158–181, 5 pl., 3 graphs, 1 map, 1946.

This investigation of the cause of discolorations in the heartwood of western red cedar (*Thuja plicata*) in British Columbia was necessitated by the increasing exports of this timber. In total volume it ranks next to western hemlock [*Tsuga heterophylla*] and the average annual cut of 567 million bd. ft. for the past ten years is second only to that of Douglas fir [*Pseudotsuga taxifolia*].

The major heart-rotting fungi of living western red cedar in the coastal regions of British Columbia are, in decreasing order of importance, *Poria asiatica* [syn. *Leptoporus asiaticus* Pilát], causing brown cubical pocket and butt rot; *P. albipellucida* Baxter [cf. *R.A.M.*, xvii, p. 635], white ring rot; *Fomes pini* [ibid., xx, p. 435], white-pitted trunk rot; *Merulius* sp., brown crumbly butt rot; and *P. subacida* [ibid., xiv, p. 805], spongy white rot. In the interior east of the Coast Range they are *P. asiatica*, *P. weirii* [ibid., ii, p. 531; xx, p. 97], causing yellow ring rot, *F. pini*, *Polyporus balsameus* [ibid., ix, p. 148; xxiv, p. 298], brown cubical butt rot, *M.* sp., and *Poria subacida*. Less important parasites of the heartwood of living trees are *F. annosus* [ibid., xx, p. 388], *F. nigrolimitatus*, causing a white pocket rot and not previously reported on living trees, *F. pinicola*, *Armillaria mellea*, *Omphalia cam-*

panella, Polyporus schweinitzii [ibid., xvi, p. 428], and *Coniophora cerebella* [*C. puteana*].

The brown cubical butt and pocket rot, also called 'black rot', caused by *Poria asiatica*, is responsible for the greatest loss in living western red cedar. In the early stage of infection the wood becomes straw-coloured to pale yellow-brown, soft, and dead in appearance. Later it turns brown, becomes brittle, and breaks into small cubes, often covered with white, felt-like mycelium. Late stages of decay in the stump were either a piped rot, or a solid mass of decay not always apparently a more advanced stage of the piped condition. Higher in the trunk these two types of decay developed into typical pocket rot, or an unbroken column of decay limited to the basal 4 to 15 ft. The pocket rot extended from 6 to 80 ft. or more up the bole, severely infecting the branches which showed irregular pockets either separated by discoloured wood, or coalescing to form one large pocket.

Of the major white rots, white and yellow ring rot are so similar in appearance that the former has passed almost unrecognized, all ring rot of western red cedar having been attributed to *P. weirii*. At the yellowing stage the rot caused by *P. albipellucida* can occasionally be distinguished by a bluish or dark reddish discoloration at the limits of infection which becomes more prominent as the infected wood softens. In the advanced ring stage, *P. albipellucida* ring rot usually shows conspicuous white mycelial flecks between the laminae, and minute, elongate, fine pits on the wood surface, and is rarely fibrous. *P. weirii*, however, shows small patches or a thin web of dark brown setal hyphae between the laminae; the wood exhibits long striations, which gives the advanced rot a fibrous texture, or thin, closely wedged pockets containing, at first, white material. The final stage of white ring rot is coarsely laminated or a crumbly, shapeless mass, frequently attracting ants and termites, while that of yellow ring rot is thinly laminated and is termed 'paper rot'. Identification of the organisms by cultural methods or by the rot symptoms suggests that *P. albipellucida* is actively pathogenic only in the coastal regions, and *P. weirii* in the interior. *P. asiatica* was commonly found in association with one of the major white rots in the course of these investigations.

In all localities visited, basal wounds and fire scars were the entrance points of over 90 per cent. of the infections observed. 'Stag-head' tops, branch stubs, 'dry-side', and injured roots were also infection points, the last being of importance in young stands. The general conclusion was that *P. asiatica* was the most destructive pathogen on western red cedar throughout all the districts surveyed, nearly 70 per cent. of the infected trees being attacked by this fungus in the interior and over 50 per cent. on the coast, 30 per cent. of the length and 10 per cent. of the cubic volume being lost in trees infected by it in the former area. The high degree of incidence of *P. albipellucida* on the coast and of *P. weirii* in the interior sufficiently suggests their importance, although the small loss of poles due to these fungi indicates that they are essentially butt-rotting organisms. *P. albipellucida*, while responsible for over 40 per cent. of the infections on the coast, decays less than 2 per cent. of the volume, and about 10 per cent. of the length of infected poles. Infection by *P. weirii* in the interior, although relatively less frequent than that of *P. albipellucida* on the coast, causes approximately 8 per cent. loss of the volume and 18 per cent. of the length of infected timbers. Although the incidence of *F. pini* was low, it destroyed 15 per cent. of the volume and 50 per cent. of the pole length in timber infected by it.

Estimation of the amount of decay in standing trees is very difficult and no reliable method of prediction has been found, the nature of basal wounds being practically valueless as a criterion. Examination of growth increments covering 450 years showed that at no time did decay equal or exceed growth. Vigorous trees 30 to 50 years old can, however, be severely damaged by rot organisms. All the fungi attacking living western red cedar trees are able to continue decay in the

felled timber and most can cause decay in slash. The greatest damage to felled timber is caused by *Poria weirii*, *P. albipellucida*, and *P. subacida*. *Polyporus* [*Polystictus*] *cuneatus* and *Hymenochaete tabacina* are widely responsible for decay in sapwood and slash, the former being of major importance.

No consistent cultural characteristics were found that would distinguish *P. albipellucida* from *P. cinerescens*, although descriptions of their fructifications would readily separate them. The cultures ascribed to *Merulius* sp. could be divided into two types, 'A' and 'B', on the basis of their cultural reactions and it remains uncertain whether two organisms are involved or whether it is one species varying considerably. *Polyporus balsameus* and *Poria asiatica* are easily distinguished by comparing the sporophores and by the colour of the cultures, although young cultures are indistinguishable. The chlamydospores of *P. asiatica* are hyaline and those of *Polyporus balsameus* become dark. A check list is provided representing all the Basidiomycetes found on living and dead western red cedar in British Columbia from 1943 to 1945.

The Phomopsis disease of conifers.—*Leafl. For. Comm., Lond.*, 14, 4 pp., 3 figs., 1946.

This leaflet on the disease of conifers caused by *Phomopsis pseudotsugae* [*R.A.M.*, v, p. 259, *et passim*] is a revised edition of one that appeared some years ago. It presents in succinct form the available information on the effects of the disease on different parts of the tree (shoot die-back, stem-girdling, and stem-canker), the life-history of the fungus, age of trees affected, extent of damage, and methods of prevention.

RICHARDSON (N. A.). **Wood preservatives** (Revised edition).—*For. Prod. Res. Rec., Lond.*, 17 (Wood Pres. Ser., 3), 10 pp., 1946.

This concise account of the wood preservatives used in England is a revised edition of a publication originally issued in 1937 [*R.A.M.*, xvi, p. 788].

FINLAY (R. H.). **Timber preservation. Butt treatment.**—*Rhod. agric. J.*, xliii, 6, pp. 516–524, 3 figs., 1946.

In this paper (a reprint of *Bull.* 1159, 1940) [cf. *R.A.M.*, xxii, p. 413] detailed directions are given for the preservation of poles, mainly by the immersion process, using butt treatment. The operations involved are summarized and a note is given on the cost of the work.

CLAYTON (C. N.) & NUSBAUM (C. J.). **Experiments on the use of vegetable seed protectants.**—*Bull. S. C. agric. Exp. Sta.* 361, 24 pp., 4 figs., 1945. [Received January, 1947.]

On the basis of the tabulated results of tests at the South Carolina Agricultural Experiment Station and of those conducted in other States, the following protectant seed treatments (in oz. per 100 lb.) are recommended in order of preference: Lima beans [*Phaseolus lunatus*], spergon 3, arasan 2; beets, cuprocide 18, semesan 40, arasan 8; cantaloupe and cucumber, cuprocide 16, semesan 5, arasan 5; lettuce, cuprocide 32, spergon 16; okra [*Hibiscus esculentus*], spergon 16, new improved ceresan 4, arasan 4; paprika [chilli], arasan 8, copper sulphate solution (1 oz. in $\frac{1}{2}$ gal. water and roll in lime); peas (market or garden), spergon 3, semesan 5; soybeans (edible), spergon 5; spinach, arasan 8 to 16, cuprocide 37; maize (sweet corn), arasan 3, spergon 3; watermelon, cuprocide 16, semesan 5, arasan 5.

FLENTJE (N. T.). **Poor emergence in Peas. A report for the benefit of growers.**—*J. Dep. Agric. S. Aust.*, l, 5, pp. 246–249, 3 figs., 1946.

Poor germination of seed crops of William Massey, Greenfeast, and Canner's Perfection garden peas in South Australia was found to be due to destruction of the

seed three or four days after sowing by soil-inhabiting fungi. Losses of 50 per cent. were recorded in light, sandy soils; in the heavier red-brown soils of the Adelaide plains losses were much less severe. Seed sown in moderately dry soil with warm, dry conditions up to two weeks after sowing germinated much better than the same seed in moist soil and with ½ in. rain two to three days after sowing. When the peas were grown on the same land in two successive years, seed-rotting was generally much more severe in the second crop. The only seed treatment among several tested that gave beneficial results was tetroc (spergon) [cf. *R.A.M.*, xxv, pp. 128, 386]. This used at 2 oz. per bush. gave almost complete control in all soils, and very good control in second crops on the same land. The plants from the treated seed also appeared more healthy and vigorous than those from the untreated.

It is recommended that sowing should be carried out in fairly dry conditions (e.g., in the Adelaide plains in late autumn before the rains break), peas should be grown only once in five years on the same land, and all seed should be dusted with spergon.

SAYRE (C. B.). **Rate of seeding treated Peas.**—*Food Packer*, xxviii, 2, pp. 63–64, 66, 1947.

From a tabulated account of preliminary tests at the New York Experiment Station in 1946 to determine the most profitable rate of sowing spergon-treated peas, it appears that 3 bush. per acre is likely to give larger net returns than 4 or 5, thereby reducing the cost of production [cf. *R.A.M.*, xxiii, p. 511 *et passim*].

SCHULTZ (H. K.) & DEAN (L. L.). **Inheritance of curly top disease reaction in the Bean, Phaseolus vulgaris.**—*J. Amer. Soc. Agron.*, xxxix, 1, pp. 47–51, 1947.

The information accumulated at the Idaho Agricultural Experiment Station on the inheritance of reaction to the beet curly top virus in beans (*Phaseolus vulgaris*) is summarized. Resistance has proved to be dominant in its mode of inheritance in crosses between the resistant Common Red Mexican, Burtner, and Great Northern U. 1. 15 [*R.A.M.*, xx, p. 42] and the susceptible Red Kidney, Park Red Kidney, and Bountiful. The cumulative experimental data indicate that two factors in dominant and recessive epistasis may explain the manner of inheritance of the curly top reaction.

MCWHORTER (F. P.), BOYLE (L.), & DANA (B. F.). **Production of yellow Bean mosaic in Beans by virus from mottled Gladiolus.**—*Science*, cv, 2720, pp. 177–178, 1947.

In 1939 Mr. Carl Robertson, of Eugene, Oregon, drew the attention of the authors to a field of Blue Lake beans (*Phaseolus vulgaris*) next to one of *Gladiolus* spp., pointing out that a gradient infection of [bean yellow] mosaic extended from the row nearest the gladioli to a distance of some 150 ft. He expressed the view that the gladioli were probably the source of the virus [cf. *R.A.M.*, xxv, p. 303]. Subsequent observations and tests proved the assumption to have been correct. Since that date, the writers have observed the same bean virus 2 [bean yellow mosaic virus: ibid., xxiii, p. 1] correlation wherever snap beans were exposed to commercial plantings of gladioli. In 1945, for example, a two-acre test planting of *P. vulgaris* in a large, well-tilled field near Salem, Oregon, had no other legumes in the vicinity, and no usual source of the virus. One end of the field was exposed to a five-acre planting of gladioli growing weed-free in very good conditions. The bean rows ended 15 ft. away. An extremely severe outbreak of bean yellow mosaic began early in the season at the end next to the gladioli, developing into a gradient infection spreading for 200 ft. All the beans within 50 ft. of the gladioli were ruined. In a second case, near Portland, two rows of snap beans ran parallel to and

20 ft. from gladioli in a commercial field. At the end of the bean rows and equally exposed to the gladioli was a planting of Lima beans (*P. lunatus*). All the snap beans and none of the Lima beans were dwarfed by necrotic and yellow strains of yellow mosaic. No seed transmission of any strain of the virus could be demonstrated.

Yellow mosaic appears to be due to a complex of bean yellow-mosaic virus strains. In tests of commercial gladiolus plants as sources of the yellow-mosaic complex, using *Vicia faba* plants as test plants [ibid., xxi, p. 61], positive transmission resulted in four of nine trials, the isolations including not only typical bean yellow mosaic but some of the necrotic types also.

Miller (G. L.) & Price (W. C.). **Physical and chemical studies on southern Bean mosaic virus. II. Crystallization by dialysis. III. Electrophoretic and nucleic acid studies.**—*Arch. Biochem., N.Y.*, xi, 2, pp. 329–335, 337–343, 4 figs., 1946.

This study describes the crystallization of a plant virus by dialysis [cf. *R.A.M.*, xxv, p. 325] first observed at room temperature during a long dialysis of southern bean mosaic virus against distilled water. A high yield of crystals was obtained (89 per cent.) and recrystallization was readily carried out, the product being of low ash content in contrast to those gained by salting-out. The crystals were unusually large, some reaching 3–4 mm. in length and tending to be glutinous and to dissolve when in contact with glass.

The identity of the crystals was established with the virus protein itself. In general, the crystallization of the virus was observed to yield various modifications of rhombic plates and prisms against distilled water, tap water, and acetate buffer at pH 5·5. The pH of the dialysis medium and the purity of the starting material were found to be important to the crystallization process.

Electrophoretic studies of the virus by the moving boundary method [cf. ibid., xxv, p. 437] revealed a single component electrochemically stable at 0° C. within a pH range of 2·92 to 11·5, and with an isoelectric point of pH 5·5. Outside this stability range at pH 1·97 and 12·45, the virus was split into multiple components with unusual mobilities.

Sneep (J.). **De Ascochyta-vlekkenziekte van de Boon (Phaseolus).** [*Ascochyta* spot disease of the Bean (Phaseolus).]—*Tijdschr. PlZiekt.*, li, 1, pp. 1–16, 1945. [English summary. Received November, 1946.]

This is a comparative study of the symptomatology of the bean (*Phaseolus vulgaris*) diseases caused by *Ascochyta phaseolorum* [*R.A.M.*, xii, p. 330] and *A. boltshauseri* [ibid., xiv, p. 613], and *Colletotrichum lindemuthianum* [see next abstract], and of the pathogenicity, morphological and physiological characters, taxonomy, and life-histories of the causal organisms. The *Ascochyta* diseases are indistinguishable macroscopically, the characteristic symptoms of both being brown, later black, striping of the hypocotyl, leaf spots forming concentric rings, less regular pod spots, and dark spots with greenish-grey edges on the seeds. During cool, wet weather the whole plant is attacked leaving, eventually, only dark brown stems and pods. The leaf and stem spots caused by *C. lindemuthianum* are depressed and sharply demarcated by a raised yellow margin; seed spots are surrounded by a light brown border.

All varieties cultivated in Holland are susceptible to the *A.* spp., white field beans in particular. Thorough field sanitation and the use of healthy seed are the most effective control measures; ten minutes' immersion of the seed in 0·25 per cent. ceresan at 20° C. was only partially successful, while the hot-water treatment gave negative results. The two fungi persisted in a viable condition in seed stored in a dry place for 2½ years.

HUBBELING (N.). **De invloed van de uitwendige omstandigheden bij het optreden van Boonenziekten.** [The influence of environmental conditions on the occurrence of Bean diseases.]—*Tijdschr. PlZiekt.*, xlviii, 6, pp. 225–234, 5 pl., 1 graph, 1942. [English summary. Received November, 1946.]

Potash deficiency symptoms were conspicuous in beans (*Phaseolus vulgaris*) in the Wageningen district of Holland during the warm, dry months of June and July, 1941, but had disappeared by the end of the wet August.

Virus diseases, especially the bean mosaic and yellow mosaic viruses, were also widespread in June and July, when the prevailing conditions favoured the chief aphid vector, *Doralis* [*Aphis*] *fabae*. 'Stipple-streak' (*Nicotiana* virus 11 [tobacco necrosis virus: *R.A.M.*, xxiv, p. 76]) was partially masked during June and July, but in August the typical red-brown ring spots developed on the leaves. All the varieties of *P. vulgaris* investigated were susceptible to the virus, but *P. multiflorus* remained immune both in the field and in laboratory tests.

The seed-borne 'grease spot' or 'halo blight' [*Pseudomonas medicaginis* var. *phaseolicola*: ibid., ix, p. 696; xvi, p. 150], barely noticeable in June and July, severely attacked Ceka brown beans in August.

The development of rust (*Uromyces appendiculatus*) coincided with the onset of humid conditions towards the close of the season, and consequently little damage was caused.

Seed-borne infection by *Colletotrichum lindemuthianum* was responsible for the death of a number of young plants; others recovered during the hot spell in June and July, only to be heavily attacked again in August. A similar course was pursued by *Ascochyta boltshauseri*, *A. phaseolorum* [see preceding abstract], *Fusarium* sp., *Sclerotinia sclerotiorum*, and *Botrytis cinerea*, all of which flourish under cool, moist conditions.

MASTENBROEK (C.). **De vatbaarheid van Bonenrassen voor de vetvlekkenziekte.** [The susceptibility of Bean varieties to the grease spot disease.]—*Tijdschr. PlZiekt.*, xlix, 5, pp. 135–162, 1 diag., 1943. [German summary. Received November, 1946.]

Of 64 bean (*Phaseolus vulgaris*) varieties tested for their reactions to the 'grease spot' or 'halo blight' disease [*Pseudomonas medicaginis* var. *phaseolicola*: see preceding abstract] in the laboratory and (for the most part) in the field, 16 were highly resistant, of which only one, Blanca, was of Dutch origin. Among the others (all American) were Robust, Cornell 22, Great Northern 81, 123, 139, Japanese white, Michelite, and Michigan white.

White rot disease of Onion bulbs. Sugar Beet yellows.—*Adv. Leafl. Minist. Agric. Fish., Lond.*, 62, 4 pp., 1 fig.; 323, 4 pp., 4 figs. (2 col.), 1946.

The available information on the symptoms, etiology, modes of dissemination and infection, and control of onion white rot (*Sclerotium cepivorum* [*R.A.M.*, xxv, p. 90] and sugar beet yellows [ibid., xxvi, p. 39] in England and Wales is summarized in popular terms.

SEVERIN (H. H. P.). **Evidence of nonspecific transmission of California Aster-yellows virus by leafhoppers.**—*Hilgardia*, xvii, 1, pp. 21–53, 3 pl. (2 col.), 1945. [Received February, 1947.]

Studies (with J. S. LILLEY) demonstrated six new vectors of the California aster yellows virus [*R.A.M.*, xxv, p. 242], *Texananus lathropi*, *T. latipex*, *T. spatulatus*, *T. oregonus*, *T. pergradus*, and *Phlepsius apertinus*. The infections produced by 150 males and 150 females of *T. lathropi* kept singly on healthy celery plants amounted to 18·7 and 16 per cent., respectively, and by 100 males and 100 females of *T. latipex* to 18 and 32 per cent., respectively. The length of the period of

exposure of healthy celery to both these leafhoppers affects virus transmission, daily transfers to and from asters causing lower percentages of infection in celery than weekly transfers. Lower percentages of infection occurred with asters than with celery, and usually they were less infected by daily than by weekly transfers. Higher percentages of infection occurred in six successive asters inoculated by *T. latipex* every three weeks than in daily or (with one exception) weekly inoculations. It appears that greater numbers of leafhoppers cause higher percentages of infection.

The minimum latent period in the males and females of *T. lathropi* was 7 and 8 days, respectively, while in *T. latipex* males it was 8 days. The maximum latent period in *T. lathropi* was 33 and in *T. latipex* 37 days. The virus was retained by single adults of *T. lathropi* for 5 to 77 days and by *T. latipex* from 1 to 42 days after the first infection. Many individuals of both species caused only a single infection each.

Single males and females of *T. spatulatus* reared on infected celery infected 34 and 29 per cent., respectively, of healthy celery plants; lots of 5 males and 5 females infected, respectively, 88 and 72 per cent. at the first transmission and 40 and 50 per cent., respectively, on transference to a second set of plants. In transferences to celery and asters alternately lots of 40 males and 40 females infected, respectively, 28·7 and 17·3 per cent. of celery in daily and 80 and 23·1 per cent., respectively, in weekly transfers; only 0·6 per cent. of the asters were infected in the daily and none in the weekly transfers. Lots of 5 males and 5 females kept on asters throughout adult life infected 8 and 12 per cent. of the plants, respectively. Lots of 40 males and 40 females reared on affected asters infected 1·7 and 0·7 per cent., of healthy plants, respectively, in daily transfers. Latency in the adults was 6 to 42 days. One male retained the virus for 84 and one female for 99 days. Most adults gave only one infection.

Males and females of *T. oregonus* tested singly on healthy celery infected 5 of 14 and 11 of 22 plants, respectively, while lots of 2 to 10 adults infected 12 of 31 plants.

Kept singly on healthy celery, 100 males and females of *T. pergradus* caused no infection; one aster was infected by 1 of 50 males. Twelve lots of 10, 25 lots of 20, and 5 lots of 40 males produced 1, 5, and 1 infections, respectively, on celery.

With *P. apertinus*, 13 males and 12 females, tested singly, infected 7 of 13 and 8 of 14 celery plants, respectively, while lots of 2 to 30 adults infected 14 of 37 plants.

SEVERIN (H. H. P.). **Longevity, or life histories, of leafhopper species on virus infected and on healthy plants.**—*Hilgardia*, xvii, 3, pp. 121–133, 1 col. pl., 1946.

The life-cycles of nine different vectors of California aster yellows virus [see preceding abstract] appear to be adversely affected in several ways if carried out on celery plants which are not virus-infected. The species concerned are *Texananus denticulus*, *T. pergradus*, *T. spatulatus*, *T. lathropi*, *Cloanthanus irroratus*, *Eusceles maculipensis*, *Colladonus geminatus*, *C. montana*, and *Idiodonus kirkaldyi*. In all cases the nymphs developed normally on infected celery or asters, but the adults died on transference to healthy plants. In *T. pergradus*, for instance, the males survived on an average for 4·8, the females for 6·7, days after transference to healthy celery as compared with no deaths in 24 days on infected plants. In *T. spatulatus* the average life of infective males and females was, respectively, 51·6 and 69 days, as against 17·9 and 20·3 for non-infective insects. In *T. lathropi* an average brood on infected celery was 341 hoppers, compared with 91 on healthy plants. It further appeared that the nymphal stages required longer time for development on healthy celery. In *T. spatulatus* beet curly top virus gave a similar result although the species is not a vector of this disease. In the case of *Eutettix tenellus*, no shortening of the nymphal stages on infected beets was observed.

SEVERIN (H. H. P.). **Transmission of California Aster-yellows virus by the first reported leafhopper vector in Gyponinae.**—*Hilgardia*, xvii, 3, pp. 139–150, 2 col. pl., 1946.

Gyponana hasta has been found to transmit California aster yellows [see preceding abstracts]. Nymphs were reared on infected celery plants and the adults transferred singly to healthy plants for the remainder of their lives. Of 50 males 18 per cent. and of 50 females 12 per cent. transmitted the virus. A few more infections were caused if a number of males or females was used, the males always inducing rather more than the females. In a similar experiment with asters only four plants of 130 became diseased. The percentages of infection caused by groups of 20 infective males transferred every three weeks to healthy plants were, in three successive periods, 52·4 (celery and asters), 28·6 (asters), and 5·3 (asters), the falling-off being ascribed in the third case to death of the males. These percentages are much higher than those for fortnightly or weekly transfers. A range in the minimum latent period of 19 to 35 days was recorded. Most adults reared as nymphs on diseased plants lost the infective dose after one infection; a range of retentivity of 11 to 46 days was found in a few male leafhoppers.

GORLENKO (M. V.) & VORONKEVICH (I. V.). **The cycle of development of the agent of the bacteriosis of Cucumbers Bacterium lachrymans Sm. et Bryan under natural conditions.**—*C. R. Acad. Sci. U.R.S.S.*, li, 8, pp. 641–644, 1946.

The cucumber leaf and fruit disease caused by *Bacterium* [*Pseudomonas*] *lacrymans* is stated by Sigriansky to be one of the most serious troubles affecting the crop in the U.S.S.R. [*R.A.M.*, xvi, p. 696; cf. also ibid., xvii, p. 370]. According to Galenovich and Chernysheva in 'Pests and diseases of kitchen-garden crops', 1943 [Russian], the bacteriosis causes a yield reduction of up to 50 per cent. in the Moscow province. A study was carried out at the Moscow Plant Protection Station to supplement the scanty information available in Russian literature on the life-cycle of the pathogen.

Diseased seeds were found to produce infected seedlings (with necrotic cotyledons) which either died or developed into stunted plants yielding few or no fruits. The shrivelled portions of the seedlings crumble and are conveyed by wind or raindrops to the foliage, on which they produce fresh infections. The bacteria are not confined to the seed surface but penetrate deep into the tissues, where they resisted formalin treatment, but infection was reduced from 7·1 to 1·2 per cent. by five minutes' immersion in NIUIF-1 (ethyl mercury phosphate) [ibid., xx, p. 296] at 1 in 200. The seeds contract infection at the time of collection, when bacteria from the pulp of diseased fruits penetrate the soft testas of healthy seeds in the same containers. The pathogen was shown experimentally to overwinter only in well-preserved diseased leaves left on the surface of the soil, so that plots on which cucumbers have been grown can be partially freed from infection by autumn tilling; in the course of the next year or two the leaves on the surface, like those buried under the soil, will undergo decomposition and the bacteria inhabiting them will perish. After two to three years the same ground may be replanted with cucumbers.

SAKIMURA (K.). **Virus transmission by Cuscuta sandwichiana.**—*Phytopathology*, xxxvii, 1, pp. 66–67, 1947.

At the Pineapple Research Institute, Honolulu, Hawaii, the cucumber mosaic virus was readily transmitted from infected to healthy cucumbers by means of an endemic species of dodder, *Cuscuta sandwichiana* [cf. *R.A.M.*, xxiv, p. 306]. Twenty-one test plants connected by the dodder with infected cucumbers contracted the disease, but no symptoms developed in 19 others to which terminal

cuttings from the parasite grown on mosaic plants were attached. The Hawaiian dodder does not appear to be so efficient as other dodders in retaining the virus. Negative results were given by repeated attempts at the transmission of the tomato spotted wilt virus from diseased to healthy plants with the aid of *C. sandwichiana*.

LEVINE (M.). **Crown gall disease on Rhubarb.**—*Bull. Torrey bot. Cl.*, lxxiv, 2, pp. 115–120, 12 figs., 1947.

In a plot at the Montefiore Hospital, New York, the author planted, together with six healthy controls, a number of rhubarb roots sent by Professor E. F. Guba, with large, tumorous masses evidently attached to or emerging from the crown, while apparently sound, pinkish buds were also present. The roots originated from stock of the 'Linnaeus' or 'strawberry' variety dating back to 1892, and had been growing on the same plot for 15 to 18 years. In 1945, during removal to another farm, some 10 per cent. of the stock was found to bear the galls, which were attributed to *B[acterium] tumefaciens*, and the intending purchaser refused to take more than half the crop. The owner, however, judging by the productivity of the stock, attached no importance to the condition.

All the experimental plants, with or without galls, produced fine, sturdy leaves in abundance, with thick, succulent petioles. Early in August, when several of those from the diseased stock were dug up, only the decomposed remains of the galls were found, the crowns and roots of the current year's growth being apparently normal. These observations corroborate the conclusion reached from previous studies on artificially induced crown galls on other garden plants [*R.A.M.*, x, p. 779] to the effect that the overgrowth is not a malignant disease in the same category with induced or spontaneous neoplasia of man or animals [cf. ibid., xxiii, p. 8 *et passim*]. It seems to be a protective mechanism of limited proliferative capacity, which matures, ages, and dies, ending as a corky, woody mass of tissue disintegrating in the soil at the close of the growing season. In the case of rhubarb, the current year's galls begin to disintegrate in the late autumn, and the new active roots and crowns may contract infection as a sequel to plucking the leaves. The slow growth of the newly formed tumours does not interfere with the freshly developing leaves, and the commercial product appears to be quite unaffected.

The rhubarb crown gall is a white mass of tissue enveloped in a heavily mottled, brownish coat. The inner structure of a fully developed gall is white and of a firm, fibrous texture. Old galls collected in November bore numerous necrotic areas round the periphery. On microscopic examination the fresh tumour reveals the characteristic appearance of crown gall.

The cultural characters of the organism isolated from diseased material closely resembled those of *Bact. tumefaciens*, not hitherto known as a pathogen of rhubarb, though slime production was exceptionally profuse and the dimensions of the rods slightly exceeded those of the tumour-producing bacteria. Inoculations with the rhubarb bacterium resulted only in the formation of well-marked scars.

HILDEBRAND (A. A.) & KOCH (L. W.). **Soybean diseases in Ontario and effectiveness of seed treatment.**—*Phytopathology*, xxxvii, 2, pp. 111–124, 1947.

All the 13 parasitic diseases of soy-bean known to occur in Canada have been found within a comparatively restricted area in south-western Ontario where the cultivation of the crop is concentrated. Eight of them have not yet been reported from other parts of the Dominion, ten have been observed in the district since 1942, while eight, or possibly nine, are known to be seed-borne. The only two of these pathogens not hitherto included in the Annual Reports of the Canadian Plant Disease Survey are *Sclerotinia sclerotiorum* and (?) *Cercosporina kikuchii* [*R.A.M.*, xvi, p. 585], both limited to Ontario.

In a three-year series of randomized experiments involving five replications, the efficacy of spergon, arasan, and fermate was tested on seed lots of the A. K. Harrow variety differing widely in respect of germinability, disease potentiality, and extent of seedcoat injury. With low-grade, weather-damaged seed, such as was produced in 1942, and the cracked-coat fraction (due to combine injury) of an otherwise superior lot grown in 1944, the use of spergon at the rate of 3 oz. per bush. increased emergence and yield. In no other instance, however, were the increases in early stands of plants resulting from seed treatment correlated with statistically significant gains in yield.

In a varietal reaction test, Earlyana was the most susceptible and Harman and Harrow A (a promising unnamed selection) were the most resistant to brown spot (*Septoria glycines*) [ibid., xxiv, p. 5; xxv, p. 297], with 89·5, 39·6, and 37·5 per cent. infection, respectively, while Lincoln and Richland were intermediate (67·7 and 66·6, respectively). There was no correlation, however, between the incidence of brown spot and seed treatment or its omission.

Marchionatto (J. B.). **Observaciones sobre el comportamento patógeno y en cultivo de la Rhizoctonia solani.** [Observations on the pathogenic and cultural behaviour of *Rhizoctonia solani*.]—*Physis, B. Aires*, xix, 54, pp. 482–484, 1 pl., 1944. [English summary. Received 1946.]

Eggplant seedlings were inoculated in 1943 with nine strains of *Rhizoctonia* [*Corticium*] *solani* originating as follows: carnation 1933, potato 1935, *Cicer arietinum* 1940, eggplant and chilli 1941, and *Pinus halepensis*, *P. radiata*, *P. pinea*, and *P. insignis* 1942. Five tests of a month's duration were performed, each involving three isolates; the resulting data showed that those of 1933 and 1935 had lost all virulence, while the 1941 and 1942 strains were still highly pathogenic and the 1940 material fairly so.

The nine strains fell into three groups in respect of their cultural characters on potato dextrose agar, namely, No. 243, with a well-developed chestnut-brown mycelium rapidly forming very minute, dark chestnut sclerotia with a tendency to disposition in lines along the wall of the tube; No. 403 with a sparse, brown mycelium, larger chestnut sclerotia distributed over the surface of the medium and scattering on reaching the wall; and No. 195, with a fairly abundant, pale yellow mycelium and compact, dark masses of sclerotia produced at both extremities of the substratum.

Atkins (F. C.). **White plaster mould.**—12 pp., 2 figs., 2 diags., Mushroom Growers' Association, Midlands Group Publications, Yaxley, Peterborough [? 1946]. 2*s*. 6*d*.

In this digest are presented for the use of mushroom-growers the history, nomenclature, morphology, cultural characteristics, and control [*R.A.M.*, xix, p. 191] of the white plaster mould, *Scopulariopsis* [*Oospora*] *fimicola*.

Nichols (R. F. W.). **Breeding Cassava for virus resistance.**—*E. Afr. agric. J.*, xii, 3, pp. 184–194, 1947.

A full interim report is given on the materials and methods now in use at Amani, Tanganyika Territory, in breeding for resistance to cassava mosaic and brown streak [*R.A.M.*, xxv, p. 27]. The first stage was the production of seed of both cassava and interspecific hybrids and the vegetative multiplication of the progeny. Field trials [ibid., xvii, p. 649] for resistance and cropping qualities were conducted in an area where disease incidence was high, and the clones were classified on a basis of resistance to natural infection as shown by statistical analyses of the results. Only those plants which escaped infection from both diseases for more than eight months (class I) or six months (class II) or showed abnormally high yields

although susceptible were retained for further breeding. Those apparently immune were tested by stem-grafting.

Interspecific hybridization was achieved between cassava and 'tree' cassava (probably a natural hybrid between *Manihot glaziovii* [Ceara rubber] and cassava), *M. glaziovii*, *M. dichotoma*, and *M. saxicola*. Back-crossing to cassava was successful. The fertility, morphology, and resistance of these hybrids are described. Strongly resistant forms of cassava and of interspecific hybrids were produced, but the results suggest that complete immunity is likely to be secured only in the *M. dichotoma* hybrids. Emphasis is laid on the fact that the efficacy of the grafting test to demonstrate immunity is governed by the particular virus strain used; immunity from one strain does not necessarily mean immunity from all.

Conclusive evidence was obtained that resistance is completely independent of climatic and soil factors; it is, therefore, to be assumed that inheritance is controlled by genetic factors.

In the cassava × cassava hybrids fertility is very low, high field resistance to mosaic and brown streak occurred in a few clones but most were susceptible. None of the highly resistant clones gave very high yields. No cassava plant so far tested by grafting with affected material has withstood infection by either disease. In the tree cassava × cassava crosses, the parent tree cassava clone was in class I for resistance to both diseases, but it was experimentally infected with mosaic by *Bemisia* sp. Although the fertility of the F_1 hybrids was very low, the plants were very vigorous and fertility improved in subsequent back-crosses. The indications for resistance in the F_3 generation (second back-cross) are encouraging, 43 clones being retained for field trial.

The *M. dichotoma* × cassava crosses so far promise the best results. All the F_1 plants remained healthy for 22 months but all were sterile at first; seeds were obtained later as a result of open pollination and by colchicin treatment. In work with the *M. saxicola* × cassava cross, *M. saxicola* was found to be highly susceptible to mosaic. The hybrids, however, are highly fertile and a watch is being kept for resistant plants. From the Ceara × cassava crosses three F_2 (first back-cross) clones have been obtained which show class I resistance to both diseases.

GOHIER (C.). **Note sur la maladie du rabougrissement ou rosette de l'Arachide à Madagascar.** [A note on the stunting disease or rosette of Groundnut in Madagascar.]—*Rev. Bot. appl.*, xxvi, 289–290, pp. 638–641, 1946.

During 1945–6, over 60 per cent. of the groundnut plantations in the vicinity of Itasy, Madagascar, gave no yield as a result of rosette [*R.A.M.*, xviii, p. 652; xxv, p. 154]. Under local conditions, attack by rosette becomes likely if during the first two months after planting retardation of growth for a few days occurs. When seed of the same variety from different areas is planted, the plants which grow most rapidly always appear to escape infection best. A slow-growing variety, Virginia Bunch, had to be discontinued at Itasy, as it always developed more rosette than earlier varieties, such as Buitenzorg and Valencia. Sowings from the same lot of seed made in the same soil at intervals of two or three days sometimes showed no infection in the first lot and 90 per cent. in the second. Late sowings made in December, after the rains have set in (sometimes planted because the November sowing has failed owing to insufficient rain), generally become so severely affected during the first two months that they give practically no yield.

In years when rosette is not very prevalent, isolated plants are attacked; circular patches of infection appear but do not spread, owing to the rapid growth of the remaining plants; the affected patches give no yield. Insect transmission [by *Aphis laburni*: ibid., xviii, p. 652] from diseased plants to very young healthy ones is generally admitted, and almost certainly occurs. If young plants are insect-infested in the main stem, the disease arrests growth above, but when a plant over

two months old becomes infected in this way, the disease almost invariably remains confined to a single branch, and the yield is not much affected.

In some years, however, a field apparently normal during the first month's growth slows down and suddenly becomes completely affected, though an adjacent field, planted a few days earlier, remains healthy. This type of attack would seem to be due, not to insect transmission, but to the effect of climatological factors, e.g., light intensity or special rays, occurring at a specific stage in the growth of the young plants. The Itasy region, situated at 1,100 to 1,500 m. above sea-level, has, at certain hours, particularly early in the rainy season, an extremely high light intensity. Attempts to reduce rosette incidence in young plants by protecting them from the solar rays by cloth screens gave completely satisfactory results, affected plants appearing only in the unprotected part of the field and at the edge of the covered part. The cover was removed at the end of two months' growth. In severely affected fields, groundnuts growing in the shade of some adventitious plant, such as *Ricinus*, are nearly always either unaffected or much less affected than the rest.

The author's observations lead him to the view that groundnut rosette is consecutive to the spontaneous appearance of special bodies formed within the host cells under the influence of light or other radiations while the plants are very young. The bodies would appear to be, probably, of the nature of heavy proteins, capable, after inoculation, of reproducing the disease indefinitely in plants of the same species. They possess the properties of diastases. There may be some similarity between this disease and vine court-noué [ibid., xxvi, p. 6], which also does not develop in the shade, is found in areas with a high light intensity, shows similar malformations, and is insect-transmitted.

Bosc (M.). **Sur les enclaves de l'oospore de Plasmopara viticola (Berk. et Curt.) Berl. et de Toni.** [On the contents of the oospore of *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni.]—*C. R. Acad. Sci., Paris*, ccxxiv, 9, pp. 667–668, 1947.

The inception of oospore formation in *Plasmopara viticola* [*R.A.M.*, xxvi, p. 94] in October was accompanied by the appearance of lipoid globules, staining with indophenol blue, Sudan III, and osmic acid and rapidly coalescing into a large central vacuole which gradually assumed a homogeneous structure and disintegrated into a mass of small globules shortly before the germination of the oospore in April to May. Starch granules 2 to 6 μ in diameter, staining blue with Lugol's iodine solution, were also observed at the beginning of oospore formation. They were either free or enclosed in a mass staining walnut-brown or yellow with Lugol, and are believed to be metabolic products of the above-mentioned lipoids. The existence of the starch granules in the form described is of brief duration; after chemical modification and fusion with the cytoplasm they are presumably concentrated in the endospore where Best's carmine and Bauer's reagent reveal the presence of saccharides.

Simon (L.). **Essais sur l'Oidium en 1943 au vignoble expérimental de Belle-Beille.** [Tests on *Oidium* in 1943 in the experimental vineyard of Belle-Beille.]—*Ann. Épiphyt.*, N.S., xi, 1–2, pp. 115–120, 1945. [Received March, 1947.]

In further work on the control of vine *Oidium* [*Uncinula necator*: *R.A.M.*, xxv, p. 434] at Belle-Beille, all the plots, including the control, received an application of alkaline Bordeaux mixture containing 0·75 kg. copper sulphate+125 gm. potassium permanganate per hl. on 1st June, with one of the latter alone on 24th June and the morning of the 17th July. In addition, plot A received 500 gm. triturated sulphur (80 per cent.) per hl.+wetter on 26th June, followed by 1 kg. of the same+wetter on 17th (evening) and 30th July. Plot B was dusted with sulphur ore

containing 10·7 per cent. pure sulphur on the same last three occasions. Plot C received triturated sulphur (80 per cent. pure sulphur) on 26th June and on the evening of 17th July. Plot D (control) received no sulphur. Plots E and F received, respectively, commercial colloidal sulphurs B and C, the former containing 500 gm. and the latter 200 gm. elemental sulphur per l. on 26th June, 17th July (evening), and 30th July. The plots thus received 29·2, 14·4, 72, 0, 8·2, and 3·28 kg. pure sulphur, respectively.

On 25th August, and on 30th September (immediately before harvesting) the control ratings (0 = no control, 10 = complete) were, plot A = 3, B = 6, C = 9, D = 0·5, E = 2, and F = 4. The crop of plot C was of much better quality than that of B. Thus, the use of a sulphur ore containing 10·7 per cent. sulphur gave results approximating to those given by 80 per cent. triturated sulphur on vines already treated with potassium permanganate. This result confirms those of 1942 [loc. cit.]. It was also ascertained that a slight attack of *U. necator* on the fruit reduced the crop by 14·4 per cent., but did not appreciably affect the sugar content of the berries. It appears that in future it will be possible in the control of the disease to make greater use of home-produced sulphur than has been the case in the past.

STAEHELIN (M.) & WURGLER. **Quelques cas de rabougrissement de la Vigne.** [Some cases of Vine die-back.]—*Rev. romande Agric., Vitic., Arboric., 1947*, 2, pp. 11–14, 5 figs., 1947.

The form of vine die-back investigated by the authors in Switzerland is characterized by short, thin tendrils, slight chlorosis and reddish-brown spotting of the foliage, and a tendency to 'coulure' [*R.A.M.*, xxvi, p. 182]. It is due to a number of causes, of which only two are discussed in the present contribution, namely, the use of immature stocks for grafting, resulting in imperfect unions, and injuries of various kinds inflicted in grafting and other cultural operations. Defective unions give rise to the cortical fissures, permitting the entry of fungi causing medullary rots, and to the formation of false callus at the juncture between scion and stock, which is attended by occlusion of the vessels with tyloses and consequent translocatory disturbances. Among the fungi isolated from the pith and xylem of stocks invaded through the false callus developing round wounds made in the 'heel' during the excision of the buds preparatory to grafting was *Pumilus medullae* [ibid., xviii, p. 294].

BASTISSE (E. M.). **Essai de thérapeutique interne du court-noué des Vignes de Champagne par les complexes métallo-siliciques.** [An experiment in internal therapy of court-noué of Champagne Vines by metallo-silicic compounds.]—*C. R. Acad. Sci., Paris*, ccxxiv, 8, pp. 590–592, 1 graph, 1947.

Each year from 1944 to 1946 inclusive, 657 vines in the Möet and Chandon vineyards at Épernay and Mesnil-sur-Oger were given injections in April and June of 26 metallo-silicic compounds (10 per cent. metal) at a dosage of some 3 gm. per stock. Iron, manganese, uranium, and lanthanum proved to be the most effective of the substances tested, while mercury, copper, zinc, and lead were also beneficial. The improvement in the health of the vines was cumulative, becoming more noticeable in the second year. Early treatments gave better results than late ones.

GILBERT (F. A.). **The status of plant growth substances and herbicides in 1945.**—*Chem. Rev.*, xxxix, 2, pp. 199–218, 1946.

Included in this review of 175 contributions (mostly recent) to the knowledge of plant growth substances and herbicides are references to various matters of phytopathological interest. An interesting and untouched problem for further research

is the possibility of a connexion between growth substances and viruses, suggested by the similarity of the formative effects induced in plants by naphthoxy and substituted phenoxy compounds and substituted benzoic acids to those associated with virus infection.

Rapport sommaire sur les travaux de pathologie végétale effectués dans les stations et laboratoires en 1943. Rapport sommaire sur les travaux de pathologie végétale effectués dans les stations et laboratoires en 1944. [Brief report on the plant pathological work carried out in the stations and laboratories in 1943. Brief report on the plant pathological work carried out in the stations and laboratories in 1944.]—*Ann. Épiphyt.*, N.S., xi, 3–4, pp. 245–247, 249–251, 1945. [Received April, 1947.]

In the first of these reports [cf. *R.A.M.*, xxv, pp. 382, 438] it is stated that further comparative spraying tests carried out in 1943 against vine mildew [*Plasmopara viticola*] with different materials containing reduced quantities of copper showed that Bordeaux mixture and similar treatments are still the most effective [cf. ibid., xxv, pp. 488, 537]. Trials at Versailles, Montpellier, and in the south-west of France demonstrated that when copper is readily obtainable, only the older products should be used. Of the new ones, one of the best was Bayer W 2317 [ibid., xxvi, p. 208], which gives adequate protection in years of slight infection, though in ordinary seasons its use is inadvisable. Its fungicidal activity, however, appears to be greater than might be expected from the small amount of copper it contains, and it may prove useful as a supplementary treatment (when copper is short) to Bordeaux mixture. Products containing no copper were useless. Vine court-noué [ibid., xxvi, p. 226] causes appreciable loss in the south of France; an organization should be formed to assist in the selection of healthy vines for planting. Tests in the south-west of France showed that satisfactory control of peach leaf curl [*Taphrina deformans*: ibid., xxv, p. 438] is given by winter disinfection of the trees with reduced amounts of copper; commercial brands of barium sulphide again gave good results. To the materials that can be used for disinfecting cutting-knives against spreading bacterial wilt of potatoes [undetermined: ibid., xxiv, p. 471] is added potassium sodium lye. Poppy wilt was uncommon at Versailles: the disease is probably similar to that attributed to *Helminthosporium papaveris* [ibid., xvii, p. 96] in other countries; infection is favoured by drought.

In the second report it is stated that against vine *Oidium* [*Uncinula necator*: ibid., xxvi, p. 228] commercially pure sulphur (sublimated or triturated) is recommended, sulphur mixed with an inert powder giving results more or less in accordance with the amount of sulphur contained in the mixture. Crushed natural ores containing traces of sulphur had only a very weak effect. Wettable sulphur did not give such good results against *T. deformans* on peach as did Bordeaux mixture and the polysulphides. At Versailles, applications of Bordeaux mixture on 22nd April, 9th May, and 16th June completely controlled *Entomosporium maculatum* [*Fabraea maculata*: ibid., xxii, p. 364] which had been rather abundant on quince during earlier years.

The degree of maturity of potato tubers was ascertained to play a part in the development of *Fusarium caeruleum* [ibid., xxv, pp. 522, 575]. Soil transmission was only of secondary importance in the transmission of potato bacterial wilt. External disinfection of maize seed against smut [*Ustilago maydis*] was unavailing, but hot water treatment at 52° C. markedly reduced the percentage of affected ears, suggesting that the disease results from internal infection of the seed.

SIMMONDS (J. H.). **Report of the Plant Pathology Section.**—*Rep. Dep. Agric. Qd, 1945–46*, pp. 26–27, 1946.

The officer's report for 1945–6 [*R.A.M.*, xxv, p. 541] states that *Armillaria mellea* [ibid., xxiv, p. 453] on stone fruits is increasing in the Stanthorpe district.

In tests ceresan and agrosan proved better than non-mercurial dusts for groundnut seed treatment [ibid., xxv, pp. 199, 332] in the Kingaroy district. Seed disinfection has kept down crown rot [*Aspergillus* sp.; ibid., xxvi, p. 180] of groundnuts receiving good cultivation. One isolated crop on non-typical soil developed a serious form of the root rot caused by *Sclerotium rolfsii*.

The onion crop in the Lockyer Valley was heavily attacked by downy mildew [*Peronospora destructor*; ibid., xxv, p. 96] resulting in small bulbs from the earlier crops and a reduction in the seed crops. Carrots sustained losses of up to 40 per cent. from crown rot due to soil-inhabiting fungi of the genus *Rhizoctonia*.

URQUHART (D. H.). **Report on the Department of Agriculture, Gold Coast, for the year 1945–6.**—12 pp., 1946.

This report [cf. *R.A.M.*, xxv, p. 253] states that the 1945–6 cacao crop in the Gold Coast amounted to 204,000 tons, as against 285,000 tons for 1935–6. The effect of swollen shoot [ibid., xxv, p. 549] has been most marked in the older cacao-producing areas, especially the Eastern Province, which yielded 70,000 tons in 1945–6 and 116,000 tons eight years before. The amount of disease present increased about tenfold in five years. A preliminary survey begun in 1944 showed that from the original focus a few miles west of Koforidua in the Eastern Province, the main spread has been to the west as far as the Central Province boundary, and north-west up both sides of the Eastern Scarp to Agogo in Ashanti. From an area of infection round Peki, small isolated outbreaks run northwards on both sides of the Volta River. The northernmost outbreak in this chain is some ten miles north-west of Kpandu. In Ashanti, a chain of outbreaks runs from Agogo south-west through Nyabo, Konongo, Lake Bosumtwi area, Bekwai, Akokerri, and Sikamang to outbreaks near Dunkwa. There are also two small isolated outbreaks in the Pamu area. In the Western Province, from the original focus round Wiawso, there has been general spread eastwards to the Ancobra River, down the valley of the Taro River and westward to the French border, near which three secondary foci were found, at the northern tip of the Province where it meets the Ashanti boundary, about 20 miles south of this and 15 miles from the nearest outbreak of the Wiawso group, and round Enchi. An important decision reached in conference was that farmers should be encouraged to plant cacao in areas where swollen shoot has been treated and where conditions particularly suitable to this crop prevail.

The control measures so far carried out in the campaign against the disease have consisted in cutting out all infected trees by severing the lateral roots and cutting the main trunk just below ground-level. This is to be followed by regular re-inspections and the removal of all re-infections.

In the Eastern Province, 101 sq. m. were surveyed and 516 outbreaks recorded, of which 223 were treated. In Ashanti the disease was found to have affected about 800 acres, and about 80 of these were treated. In the Western Province a mild form of the disease occurs which merits special study. Here no cutting-out was done, but a fresh survey was planned, and a number of farms marked out for special observation of this form of the disease.

A survey of the lime-growing areas in the Asebu–Abakrampa area early in 1945 showed the presence of 1,073 lime farms covering some 3,000 acres. A re-survey in November of 10 per cent. of the farms in each age-group showed that the percentage decrease in tree population in the 108 farms was 14·9, or a decrease of 7,680 trees in a little over nine months [cf. ibid., xxv, p. 253]. A further 4·3 per cent. of the trees were very unhealthy or actually dying. The decrease was uniform for farms of all age-groups. It is apparent that a serious widespread decline is occurring in lime farms in all areas and all age-groups. It is considered, however, that neglect and bad cultural practices are almost as important in this connexion as actual disease, which often follows on and is incidental to unsatis-

factory management. Unfavourable soil and climatic conditions must also be reckoned with. Though it has not yet been conclusively established that *Ganoderma lucidum* [loc. cit.] is actively parasitic, there is abundant evidence that it is usually associated with dead and dying groups of trees, infection spreading from a central focus. The presence of this fungus on a farm seems almost invariably to be followed by deterioration of the limes. The species of *Trametes* [loc. cit.] also commonly encountered on half-dead trees appears to be a true saprophyte.

Leaf specimens from healthy limes and from others showing chlorotic symptoms were sent to East Malling for spectrographic analysis. The evidence obtained indicated that some of the trouble may have been due to lime-induced chlorosis. Further investigations are in progress.

At Asuansi Station, grapefruit and other sweet citrus species budded on to sour orange stocks continued to die out, and small hope is entertained for the remaining trees, nearly all of which show the familiar signs of chlorosis and defoliation and an accumulation of starch above the scion-stock union. The sole exceptions are lemon-trees on sour orange stocks, which have remained healthy and yield well.

Chaves Batista (A.). **Principais doenças das plantas em o nordeste.** [Principal plant diseases in the north-east].—*Bol. Agric., Pernambuco,* xiii, 4 pp. 195–252, 19 figs., 1946.

This is the first instalment of a list of the principal diseases of cultivated plants (in alphabetical order of their Portuguese names) in Pernambuco, Brazil, with recommendations for their control. Among the many items of interest are the following. Black rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) is a major disease of pineapple, particularly affecting the white and yellow varieties, Red Spanish being one of the more resistant.

Climatic conditions in the north-east preclude large-scale infection of beet leaves by *Cercospora beticola*.

Next to the 'tristeza' form of root rot [see below, p. 298], foot rot, caused in Bahia by *Phytophthora citrophthora, P. terrestris* [*P. parasitica*], and *P. parasitica,* is the most important disease of citrus in the regions included in the survey.

Apart from witches' broom [*Marasmius perniciosus*], the predominant pathogen in the cacao plantings of Amazonia [*R.A.M.*, xxiii, p. 379], black pod (*P. palmivora*) is a limiting factor from April to June on the estates of Bahia and Pernambuco, where the losses may exceed 30 per cent. of the crop on densely planted, ill-drained sites.

P. palmivora is also responsible for coco-nut bud rot throughout north-eastern Brazil, where it is uniformly found in association with *Bacillus* [*Bacterium*] *coli* [ibid., i, p. 59; ii, p. 268; iv, pp. 279, 347, 414; ix, p. 88; xi, p. 41]. *Catacauma torrendiella* n.sp. [without a Latin diagnosis] was isolated from coco-nut leaves bearing yellow, later dark-coloured lesions from which arose well-defined, black, stromatic intumescences, often secreting a gummous exudate. Similar structures were observed on the peduncles. The disease is prevalent from Bahia to Parahyba, killing the palms under conditions favouring the causal organism, further details of which are expected to be published.

Bacteriosis due to *Phytomonas manihoti* is the most serious disease of cassava, especially in Bahia, where it was recorded in 1943, milder cases having also been reported from Sergipe, Alagoas, Pernambuco, and Parahyba [cf. ibid., xxii, p. 465].

Fifty-seventh Annual Report of Purdue University Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1944.—102 pp., 1944. [Received November, 1946.]

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, xxiii, p. 287].

In the section on plant diseases pp. 56–59, J. A. McClintock states that continued indexing of a 1943 shipment of Manetti rose stocks on seedling stocks has shown that some collections of Manetti stocks may be sources of rose viruses [unspecified] and these findings would justify the indexing of suspicious material in commercial supplies of this stock.

R. W. Samson states that specimens of greenhouse lettuce affected by an unidentified virus disease often show symptoms similar to brown blight, a disease of undetermined origin, and spotted wilt [tomato spotted wilt virus] although the causal agent is not the same. Infected plants are stunted and asymmetrical, the leaves bear dead spots, and the disease is transmissible by rubbing infected juice from one plant on to healthy leaves of another. Up to 60 per cent. severe infection is reported. Aphids [unspecified] transmitted the disease which can be efficiently controlled if these are kept down. The same worker succeeded in reproducing the single-virus streak of greenhouse tomatoes [caused by a strain of tobacco mosaic virus: ibid., xxii, p. 500] by artificial inoculation in the spring of 1944. A more conspicuous mosaic appeared on the younger plants than on the older specimens, which developed a rolling and slight rosetting of the terminal leaves. Typical necrotic streaks appeared on three of the inoculated plants. R. W. Samson and R. M. Caldwell have bred several new canning tomato strains resistant to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: ibid., xxv, p. 478]. Field tests have yet to be made but greenhouse tests which wipe out the Rutgers and Pritchard varieties, leave the new strains of Red Currant [*Lycopersicon pimpinellifolium*: ibid., xxvi, pp. 83, 176] parentage uninjured. Promising hybrids resistant to *Septoria* [*lycopersici*: ibid., xxiv, p. 252] have been selected from crosses between *L. hirsutum* and commercial varieties by G. B. Cummins and R. M. Caldwell. Observations by A. J. Ullstrup of backcross progenies of maize from the lines K 61 and Pr, after inoculation with *Helminthosporium carbonum* Race 1 [ibid., xxiii, p. 293], showed that the majority of waxy and sugary kernels gave resistant seedlings while the non-waxy and starchy ones usually produced susceptible plants.

Seven disinfectants were used by R. W. Samson on Katahdin seed potatoes planted in muck soils in 1943. Of these, wettable spergon, fermate, wettable sulphur, and thiosan reduced scab infection of the tubers [*Actinomyces scabies*: ibid., xxiii, p. 241] and new improved semesan bel and yellow oxide of mercury reduced *Rhizoctonia* infection of underground parts of stems [*Corticium solani*: ibid., xxv, p. 79].

In yield and variety tests (p. 62) R. R. Mulvey and A. J. Ohlrogge state that of the disease-resistant oat varieties Tama and Vicland [ibid., xxv, p. 554] gave the highest yields of 57·2 and 56·8 bush. per acre, respectively. Both are resistant to crown rust [*Puccinia coronata*], stem [black] rust [*P. graminis*: ibid., xxv, p. 390] except possibly races 8 and 10, and smuts [*Ustilago avenae* and *U. kolleri*: ibid., xxiv, p. 446], to which Columbia, Gopher, and Cartier are susceptible.

R. M. Caldwell, R. R. Mulvey, and L. E. Compton (p. 67) report that two new spring oat varieties, Benton and Clinton [ibid., xxv, p. 554], have been bred, surpassing all present Indiana varieties in resistance to rusts and smuts, in particular to races 8 and 10 of black rust, strength of straw, acre yield, quality of grain, and adaptability. They are medium, early in maturity, Clinton being of moderate height and Benton medium tall. They were developed from a cross between D 69 (Richland × Green Russian) and Bond. Seed should be available in 1946 to certified producers.

Starr (M. P.). **Studies of phytopathogenic bacteria.**—*Abstr. Thes. Cornell Univ.*, pp. 349–350, 1944. [Received April, 1947.]

In tests to determine the salt tolerance of 203 isolates of phytopathogenic bacteria [*R.A.M.*, xxv, p. 292], it was found that they grew over a wide range of

salt concentration. Characteristic salt tolerances for each of the species tested were observed, indicating the possibility of using this character in taxonomy. The ability of these bacteria to cause brown colorations of synthetic media containing tyrosine may also provide taxonomically useful criteria based on similarities and differences.

The characteristic yellow cell pigment of phytopathogenic bacteria of the genus *Xanthomonas* was shown to consist of two pigments, one predominant and characteristic and the other much less abundant.

KULESCHA (Z.). **Production de tumeurs par l'inoculation de Phytomonas tumefaciens dans les fragments de parenchyme vasculaire de Topinambour et de liber de Carotte cultivés in vitro.** [Tumour production by the inoculation of *Phytomonas tumefaciens* into fragments of the vascular parenchyma of Jerusalem Artichoke and of Carrot phloem cultured *in vitro*.]—*C.R. Soc. Biol., Paris*, cxli, 1–2, pp. 24–25, 1947.

Sterile sections of the vascular parenchyma tissue of the Jerusalem artichoke [*Helianthus tuberosus*] and of carrot phloem were sown on a modified Knop's medium and inoculated two days later with suspensions of *Phytomonas* [*Bacterium*] *tumefaciens* from 24- to 48-hour cultures. After five to ten days minute pustules appeared which by the end of three weeks had developed into voluminous tumours of fantastic shape, and in some cases attained a diameter of nearly 2 cm. in a month. In the artichoke sections there was a belated development of callus at a certain distance from the tumours, some of which, moreover, produced roots.

In a parallel series of tests, sections of artichoke tissue were sown on the same medium with the addition of varying concentrations of indoleacetic acid. At 10^{-6} the tumours induced by the heteroauxin developed much less rapidly than those resulting from inoculation with *Bact. tumefaciens*, but the extent of callus formation was approximately equal in both series.

DE ROPP (R. S.). **The response of normal plant tissues and of crown-gall tumor tissues to synthetic growth hormones.**—*Amer. J. Bot.*, xxxiv, 2, pp. 53–62, 14 figs., 1947.

Sunflower stem and *Vinca rosea* cambial tissue cultured on White and Braun's medium [*R.A.M.*, xxii, pp. 12, 241] proved to be exceedingly sensitive to the presence of auxins (indoleacetic, indolebutyric, and naphthalene-acetic acids) in the substratum, responding by root production to concentrations of 1 part per 100,000,000 or less. At the high concentration of 1 in 100,000, the hormones stimulated abnormal proliferation in sunflower stem cells, in consequence of which the fragments assumed an external aspect resembling that of crown-gall (*Phytomonas* [*Bacterium*] *tumefaciens*) tumour tissue. Histological examination of this material showed the original stem structure to be still present, the proliferation arising in the original cambium and causing its abnormal extension into masses of long, disconnected cells. When such fragments were transferred and maintained for six months on hormone-free agar the tissue differentiated into roots which subsequently made normal growth.

Crown-gall tumour tissue of sunflower and *V. rosea* [ibid., xxiv, p. 407] underwent no structural alteration when grown in the presence of auxin, though the higher concentrations of the hormones strongly inhibited the development of the excrescences. This absence of response to auxin on the part of tumour tissue provides a further criterion for its differentiation from normal plant tissue. The peculiarity may be attributable to the occurrence in the tissues of some growth hormones of their own production [cf. ibid., xxi, pp. 67, 186]. In the light of new evidence summarized by the writer in *Nature, Lond.*, clvii, pp. 628–629, 1946, the

tissue of grown-gall tumours appears to secrete a substance acting very powerfully on normal tissue growth.

Guyot (A. L.), Massenot (M.), & Saccas (A.). **Études expérimentales sur les rouilles des Graminées et des céréales en 1944. Études expérimentales sur les rouilles des Graminées et des céréales en 1945.** [Experimental studies on the rusts of Gramineae and cereals in 1944. Experimental studies on the rusts of Gramineae and cereals in 1945.]—*Ann. Éc. Agric. Grignon*, Sér. 3, v, pp. 33–80, 213–266, 2 pl., 1946.

From 1942 to 1944 biometrical and biological studies were carried out at the Agricultural College, Grignon, France, on 36 isolates of *Puccinia graminis* [*R.A.M.*, xxv, pp. 388, 389] of which 16 originated on *Triticum* (13 on wheat and one each on *T. turgidum*, *T. dicoccum dicoccoides*, and *T. spelta*), three on *Avena* (two on oats and one on *A. ludoviciana*), four each on rye and *Lolium* spp., two each on barley (one on two-rowed, *H. distichum*), *Aegilops ovata*, and *Arrhenatherum* spp., and one each on *Elymus canadensis*, *Lagurus ovatus*, and *Trisetum flavescens*.

The ratings for maximum infection produced experimentally (using a scale where i represents immunity, 0 extreme resistance, and IV extreme susceptibility) by the *Triticum* isolates were IV on *Aegilops*, barley, and *T.* spp., III+ on *Bromus tectorum* var. *nudus*, III on rye (with two strains only, otherwise i), II on *Lolium perenne*, and i on oats and many Gramineae. Of the wheat varieties tested, hybrid GN (offspring of Hohenheimer 77, K3, Martin, and Oro) proved highly resistant, Oro resistant, and the hybrids GC, GH, and GP, and the Mesnil variety fairly so.

The mean uredospore dimensions on the inoculated wheat plants varied considerably with the origin of the isolate and the identity of the host, the minimum length being 25·4 μ (T_6 on GL) and the maximum 33·7 μ (T_{12} on GA). The most pathogenic strain was T_{13} from Montpellier (average rating of III+) and the least T_9, collected at Grignon (II).

The maximum ratings allotted to the *Avena* [cf. ibid., xxiii, p. 337] isolates were IV on oats and other *A.* spp., III on *Dactylis glomerata* and *Phleum boehmeri*, II on *Bromus macrostachys*, and i on barley, rye, and wheat and many grasses. The mean uredospore dimensions fell well within the range usually ascribed to *P. g. avenae*.

The *Hordeum* strains induced infection rated at IV on barley, wheat, *Triticum dicoccum dicoccoides*, and *T. spelta*, III on *Aegilops ovata*, II+ on *B.* spp., and i on oats and *Avena fatua*, rye, and six genera of grasses. Of the two isolates used, H2 from *H. distichum* was the more aggressive. The mean uredospore measurements ranged from 25·4 by 16·4 to 29·3 by 17·2 μ for H2 on barley, for the same strain on wheat they were 30·5 by 16·8 μ, and for H1 on *T. dicoccum dicoccoides* the corresponding values were 32·6 by 17·6 μ. They indicate that, as other workers have shown, it is not possible to separate the strains on wheat and barley into two subspecies.

The infection ratings for the rye isolates were IV on *Agropyron repens* and rye, III on *Aegilops* spp. and barley, II+ on *Lamarckia aurea*, I on *B. maximus*, 0 on *T. dicoccum dicoccoides* and *T. polonicum*, and i on oats and four grasses. The isolates S_1 and S_2 caused heavy infection on *Agropyron* spp. and spared barley, while with S_3 and S_4 the position was reversed. Nevertheless uredospore measurements of all strains were in agreement with those for *Puccinia g. secalis*.

In respect of pathogenicity and uredospore biometry, the isolates collected on *Aegilops ovata* and *E. canadensis* appear to be very closely akin to the wheat strains. The *A. ovata* (Æ) strains induced infection rated at IV on *A. trianistata* and the Bon Fermier, Noé, Vilmorin 23, and Aurore wheat varieties, IV— on barley (including *H. distichum*), III— on *B. intermedius*, I on rye, 0+ on *Lolium linicola*, and i on oats. The mean uredospore dimensions ranged from 25·7 by 15·9 μ on *B. tectorum*

to 32·6 by 18·3 μ on Vilmorin wheat. The ratings for the *E. canadensis* (E) strain were IV— on wheat and *T.* spp., III— on its own host, II+ on rye, II on *H. distichum,* and II— on oats. The mean uredospore measurements were 33·4 by 17·6 μ on *E. canadensis,* 28·3 by 17·3 μ on *H. distichum,* 30·9 by 17·6 μ on rye, and 31·9 by 17·6 μ on Aurore wheat. The maximum infection ratings induced by the two *Arrhenatherum* (Ar) strains, which were quite different in pathogenicity, were IV— on *L. linicola,* III on *A.* spp., oats, and *Phleum pratense,* III— on *B. rubens,* II on rye, and i on barley (including *H. distichum*), *H. murinum,* and wheat. Isolate Ar 1 from *A. avenaceum* attacked rye and *L. perenne* but not oats, whereas Ar 2 from *A. bulbosum* was pathogenic to oats but not to rye or *L. perenne.* The maximum mean uredospore dimensions were 27·5 by 15·4 μ on *L. perenne.*

A strain collected on *Lagurus ovatus* induced grade IV infection on Vilmorin 23 wheat on which the uredospores measured 30·3 by 18·2 μ, but was transmissible only with difficulty to its own host (i–0).

The maximum infection ratings for the four *Lolium* isolates were IV on *L.* spp., III on *B.* spp., *D. glomerata,* and winter barley, III— on *Festuca gigantea,* II–III on *Lagurus ovatus,* II on *Avena fatua, P. arenarium,* and rye and 0 on wheat. The maximum uredospore measurements were 26 by 14·7 μ on *Lolium temulentum.* Isolates L1 and L2, which appear earlier in the field (23rd June and 9th July in 1943), are virtually non-pathogenic to oats and wheat but cause moderate to fairly severe damage on rye and barley, whereas the later developing L3 and L4 (23rd July, 1943 and 9th August, 1944) are more or less innocuous to all the cereals.

The strain from *Trisetum flavescens* (Tr 1) gave infection ratings IV on oats, III on *Arrhenatherum avenaceum,* II on *B. maximus,* 0+ on *B. sterilis* and *B. tectorum,* and i on barley (including *H. distichum*), rye, and wheat. The uredospore dimensions on oats were 27 by 16·4 μ. Tr 1 appears to be closely related, both biologically and biometrically, to Ar 2. Notes are also given on the prevalence in the field of *Puccinia glumarum,* crown rust [*P. coronata*], and *P. triticina.*

Twelve of the 65 isolates of *P. graminis* studied in 1945 were collected on wheat or *Triticum* sp., 9 each on *Agropyron repens* or *A. caninum* and *L. perenne,* 8 on barley (including *H. distichum*) or *H. murinum,* 7 on oats, *Avena fatua,* or *A. ludoviciana,* 3 on *D. glomerata,* 2 each on rye, *Arrhenatherum avenaceum, E. canadensis, F. arundinacea,* and *Poa trivialis,* and 1 each on *B. maximus, B. macrostachys,* barberry, *Aegilops crassa, Agrostis alba, Anthoxanthum odoratum,* and *Vulpia myuros.* The isolates from *Aegilops crassa, B.* spp., *E. canadensis, H.* spp., and *V. myuros* were referred to the subspecies *tritici* of *Puccinia graminis.*

The maximum infection ratings induced by the *T.* strains were IV on *Aegilops crassa* and wheat, III+ barley, III on *Agropyron caninum,* II+ on *B.* spp. and rye, and i on *L.* spp. A high degree of resistance was shown by GN, Oro, and Thatcher wheat, GP, Heines Kolben, and Warren were resistant, and GC, GH, and Hope moderately so. Strains isolated early in the season, particularly those taken at the first appearance of the rust, were the most highly pathogenic.

Particular interest attaches to the wheat isolate 123 from the Manche which was absolutely non-pathogenic to the otherwise highly susceptible Dômes, Franc Nord, and Yga varieties, and caused only slight infection on Marquillo and Riéti, likewise susceptible to the other strains; on the other hand, it severely attacked GN, Oro, Warren, and Thatcher, immune from, or highly resistant to, the remainder of the isolates tested. Five other strains showed a marked tendency to physiologic specialization. The mean uredospore dimensions of most of the *T.* isolates ranged from 29·9 to 31 by 16·8 to 17·8 μ, the minimum and maximum lengths of 25·1 and 34·1 μ occurring on the Warren and P'tit Quinquin wheat varieties, respectively, and the corresponding widths of 15·3 and 19·4 μ on Kanred and R. Leblond respectively.

Infection induced by *Avena* strains was rated as follows: IV on oats and other *A.* spp., and *V. myuros,* IV— on *Lagurus ovatus,* III on *Arrhenatherum avenaceum,*

B. intermedius, *D. glomerata*, and *F. ovina*, II+ on barley, *Koeleria cristata*, and *Lolium temulentum*, I+ on *H. distichum*, I on *Agropyron caninum*, and i on many grasses. All the varieties of oats tested were highly susceptible, especially Avoine grignonnaise. The mean uredospore dimensions were of the range usual for *P. g. avenae*.

The ratings of maximum infection induced by the *Hordeum* isolates were IV on wheat, III on *B. maximum* and *H. distichum*, II+ on barley, I on *Aegilops triaristata*, 0+ on *H. murinum*, 0 on *Agropyron caninum*, and i on *L.* spp. In general, the isolates from *H. murinum* and cultivated barley were of comparable pathogenicity. Again the forms *hordei* and *tritici* of *Puccinia graminis* appeared to be indistinguishable.

The *Agropyron* and rye isolates induced infection rated at IV on rye and wheat, III+ on *A. caninum* and *H. distichum*, III– on barley and *L. perenne*, II+ on *B. tectorum* and *L. temulentum*, II on *H. murinum*, I on *Aegilops ovata*, and i on oats and some grasses. A study of the parasitic characters of the aecidial forms developing spontaneously on barberry revealed their identity with *P. g. secalis*. The mean uredospore dimensions ranged from 24·3 to 28·4 by 15·2 to 17·1 μ on *B. tectorum* to 26·9 to 31·2 by 15·5 to 18·4 μ on *T. dicoccoides*. Some of the *Agropyron* isolates differed markedly in pathogenicity from those referred to *P. g. secalis*, being almost or quite innocuous to rye, barley, and wheat.

The isolate from *Agrostis alba* produced infection of type II on *L. temulentum* and *V. myuros*, I on *Corynephorus canescens*, and I on oats and several grasses. The mean uredospore dimensions ranged from 22·3 by 13·6 μ on *Agrostis alba* to 24·2 by 14·5 μ on *V. myuros*.

The *Anthoxanthum odoratum* strain attacked various grasses but not the cultivated cereals. The minimum uredospore measurements were 24·1 by 15·1 μ on *V. myuros* and the maximum (length) 25·9 by 15·3 μ on *B. macrostachys* and (width) 25·1 by 16·7 μ on *A. odoratum*.

On the basis of their pathogenicity, one of the two new isolates from *Arrhenatherum avenaceum*, Ar 4, was referred, together with Ar 2 from 1944, to *Puccinia g. avenae*, while the other, Ar 3, was classed with Ar 1 as a distinct form, inducing reactions of type IV on *L. temulentum*, III on *L. perenne*, II on rye, and i on oats and wheat.

The strains isolated from *B. macrostachys* and *B. maximus* were morphologically and biologically indistinguishable from *P. g. tritici*, a close relationship with which was indicated in those from *E. canadensis* and *Aegilops crassa*. The three *D. glomerata* strains were unable to attack oats.

Among the infection ratings for the *Lolium* strains were IV on *Lagurus ovatus*, IV– on *D. glomerata*, III+ on *T. dicoccum dicoccoides*, III on rye, winter barley, *Avena fatua*, and *Phleum arenarium*, II+ on barley, II on *F. arundinacea*, and i on oats and wheat. The forms developing early in the season approximate closely to *P. g. tritici* in their biological and biometrical characters, whereas those appearing later are more divergent.

The *Poa trivialis* isolate could not be differentiated from *P. g. avenae*, while the strain collected on *V. myuros* agreed in essentials with *P. g. tritici*.

Wheat and rye were found to be very susceptible and barley slightly so to a strain of brown rust (*P. triticina*) collected on *Aegilops*. *A. squarrosa* and *A. triunciale* were very susceptible to *P. triticina* from wheat, which was almost innocuous, on the other hand, to *A. crassa*, *A. ovata*, and *A. triaristata*, as well as to barley and rye.

UPPAL (B. N.) & GOKHALE (V. P.). **A new race of Puccinia graminis tritici and two biotypes of race 42.**—*Curr. Sci.*, xvi, 2, p. 61, 1947.

In the course of tests to determine the reactions of wheat varieties and hybrids

to black rust (*Puccinia graminis tritici*) at Mahabaleshwar, it was observed that certain types showing high or moderate resistance in the seedling stage to all seven races of the pathogen occurring in India, viz., 15, 21, 24, 34, 40, 42, and 75 [*R.A.M.*, xx, p. 292], developed large pustules in field trials for mature-plant resistance. From these pustules three isolates were obtained and tested on the differential wheat varieties. One induced reactions differing entirely from those associated with any of the 189 races of black rust described by Stakman *et al.* [ibid., xxiv, p. 272]. It is, however, similar to race 119 except for its effects on Khapli, which is highly resistant (1-type infection) to the latter but moderately susceptible (3 to 4) to the new race under the prevailing experimental conditions.

The other two isolates proved to be biotypes of race 42 and are designated A and B. The former induced type-4 symptoms on Khalpi, which responds to the race proper and also to biotype B by those of type 3. Biotype B is readily distinguishable from race 42 by its effects on five other differential varieties tested, namely, F × 3 (race 42 causing 2- to 3-type of infection, and B 4), C. 6014 (0 to −2 and 3, respectively), C. 14098 (0 and 4), E. 220 (0 and 3+), and Hofed 1 (0 and 3+), the corresponding grades for biotype A being 3, 2, 2, 2, and 2, respectively.

Ausemus (E. R.) & Bamberg (R. H.). **Breeding hard red winter Wheats for the northern Great Plains area.**—*J. Amer. Soc. Agron.*, xxxix, 3, pp. 198–206, 1947.

Of a large number of selections from crosses between winter wheats and the spring varieties Hope and H-44 tested in plot and nursery trials in Minnesota, strains were obtained giving a relatively satisfactory performance in respect of yield, winter-hardiness, resistance to leaf [brown] and stem [black] rusts [*Puccinia triticina* and *P. graminis*], and milling and baking qualities [*R.A.M.*, xxv, p. 298]. Several Hope and H-44 × Minturki hybrids, for instance, showed only a trace of black rust and low percentages of brown.

In Montana progress is being made in the breeding of hardy winter wheats combining resistance both to ordinary and dwarf bunt (*Tilletia caries*) [loc. cit.].

Vallega (J.). **Reacción de algunas especies espontáneas de 'Hordeum' con respecto a las royas que afectan el Trigo.** [Reaction of some wild *Hordeum* species in respect of the rusts attacking Wheat.]—*Rev. Invest. agríc., B. Aires*, i, 1, pp. 52–62, 1947.

The wild *Hordeum* species prevalent in the cereal-growing regions of Argentina are frequently attacked by the wheat rusts, *Puccinia glumarum*, *P. rubigo-vera tritici* [*P. triticina*: see next abstract], and *P. graminis tritici* [*R.A.M.*, xxii, p. 424; xxiii, p. 255; xxv, p. 257]. *H. murinum*, *H. leporinum*, and *H. spontaneum* proved highly susceptible in inoculation experiments with *P. glumarum* from wheat, *H. pusillum* var. *typicum* susceptible, and *H. compressum* moderately so, while the responses of *H. pusillum* var. *euclaston* and *H. jubatum* var. *pampeanum* were variable, some plants readily contracting infection while others resisted or escaped it.

H. murinum and *H. leporinum* were resistant to races 20 and 62 of *P. triticina*, while *H. pusillum* and its vars. *typicum* and *euclaston*, *H. stenostachys*, *H. compressum*, and *H. jubatum* were virtually immune. The wild barleys, therefore, appear unlikely to play an important part in the spread of brown rust in Argentina.

On the other hand, all the above-mentioned varieties showed some degree of susceptibility to races 11, 15, 17, and 42 of *P. graminis tritici*, *H. jubatum* var. *pampeanum*, in particular, contracting heavy infection. This species, together with *H. pusillum* var. *euclaston*, next in order of susceptibility, may well serve as one of the principal sources of diffusion of black rust in the country. The susceptibility of *H. jubatum* to *P. g. tritici* in Argentina is markedly at variance with its resistance to the rust in Australia reported by W. L. Waterhouse [ibid., ix, p. 438].

Favret (E.). **Presencia de la raza 15 de 'Puccinia rubigo-vera tritici' en la Argentina.** [Presence of race 15 of '*Puccinia rubigo-vera tritici*' in Argentina.]—*Rev. Invest. agríc., B. Aires*, i, 1, pp. 63–64, 1947.

Race 15 of wheat brown rust (*Puccinia rubigo-vera tritici*) [*P. triticina*: see preceding abstract] was detected in a sample from the Province of Buenos Aires in 1944. Its importance lies in its pathogenicity to all the varieties at present under cultivation, including Sinvalocho, and its extreme virulence on the selection Klein H. 211 (Progress × Apulia), which is resistant to the other races of *P. triticina* occurring in Argentina and has been extensively used in breeding work.

Arnaud (G.). **La carie du Blé. Questions d'hier et d'aujourd'hui.** [Wheat bunt. Questions of yesterday and to-day.]—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 1–9, 1944. [Received February, 1947.]

In view of the shortage of copper compounds for the treatment of wheat seed against bunt [*Tilletia caries* and *T. foetida*: *R.A.M.*, xxiv, p. 459; xxvi, p. 150] at the time of writing, the author gives directions for the use of other materials and lists the results obtained in 1942–3 in official tests with numerous preparations many of which gave satisfactory protection. He states that it is better to sow the susceptible Vilmorin 27 variety than to resort to resistant varieties, which are so much less productive. The recommended treatments fall into four groups, (1) copper salts (wet: copper sulphate 5 gm. per l. followed or not by dusting with lime; or 2 per cent. Bordeaux mixture; and dry: copper chloride, copper carbonate, copper oxychloride, neutral copper acetate, and various cupric products reducible to fine powders), (2) formalin for steeps and trioxymethylene for dusting, (3) organo-mercuric compounds, and (4) salicylic acid. If none of these materials is obtainable growers are advised to use only seed obtained from clean plants, to wash it with the utmost care in water, and then soak it for three hours in a mixture of 2 per cent. milk of lime and 2 per cent. sea-salt or in sodium sulphate 2 per cent. Potassium permanganate is not recommended.

Lansade (M.). **Essais de lutte contre la carie du Blé (Tilletia tritici (Bjerk.) Wint) en 1943 et 1944.** [Tests on the control of Wheat bunt (*Tilletia tritici* (Bjerk.) Wint.) in 1943 and 1944.]—*Ann. Épiphyt*, N.S., xi, 3–4, p. 177–189, 1945. [Received April, 1947.]

Experiments on the effect of a large number of compounds on the control of wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, xxvi, p. 11 and preceding abstract] carried out over a period of several years showed that copper salts are effective. Bordeaux mixture 1·5 or 2 per cent. (1 per cent. is too weak) is recommended, the seed being immersed for 20 minutes; if necessary, resort can be had to sprinkling and vigorous shovelling, using 8 to 10 l. liquid per 100 kg. seed. Copper nitrate used similarly gives comparable results. A simple solution of copper sulphate 0·5 per cent. can be used, the seed being soaked for 20 minutes and then dusted with lime. If higher concentrations are employed, there is a risk of reduced germination.

Cupric dusts, at the rate of 200 or 250 gm. per 100 kg. seed, may also be used, but their effectiveness depends on their nature, copper content, fineness, etc. It is best to use the pure product; if this cannot be done, a content of at least 25 per cent. copper is essential.

Formalin, at the rate of $\frac{1}{4}$ or $\frac{1}{3}$ l. of commercial solution per 100 l. water, stirred for 20 minutes, is a very active material; the seed must not be dried, and should be sown without delay. Dusts with a trioxymethylene base should contain at least 50 per cent. or more of the active ingredient. In most cases organic mercury derivatives gave satisfactory results. In two years' trials hexachloro-benzene proved highly satisfactory [ibid., xxvi, p. 150.]

Björling (K.). **Melanism hos olika Vetesorter.** [Melanism in different Wheat varieties.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 6, pp. 85–91, 5 figs., 1946.

During the last five years, wheat has been affected in Scania, Sweden, by a disorder occupying an intermediate position as regards symptoms between two physiological defects described from Canada, one by Broadfoot and Roberston under the name of 'pseudo-black chaff' [*R.A.M.*, xii, p. 561], and the other by Hagborg as 'internodal melanism' [ibid., xvi, p. 91]. Of 486 samples examined at the Åkarp branch of the Plant Protection Institute, only three (1942) yielded a parasitic fungus, *Septoria nodorum.* Saprophytes, with *Pullularia pullulans, Hormodendrum cladosporioides*, and yeasts predominating, developed in pure culture from about 60 per cent. of the discoloured tissues and 25 per cent. of the controls from healthy plants, while greyish-white, rod-shaped bacteria were also isolated in a few plates from both sources and inoculated into wheat seedlings with negative results.

In an experiment to determine the possible effect of soil amendments on melanism, the application of nitrogen, alone or as part of the complete fertilizer, caused an increase of 79 per cent. in internodal melanism over the amount developing in the plots given phosphate and potash or only the former.

Bellod (M.). **Notas sobre el 'mal de pie' del Trigo en la huerta valenciana.** [Notes on Wheat 'foot rot' in the Valencian irrigated zone.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiv, pp. 55–68, 9 figs., 1946.

In normal times cereals are not widely cultivated in the irrigated zone of Valencia, but from 1939 onwards the prevailing scarcity of wheat and the Government scheme of bonuses for growers resulted in a radical change in the local crop sequence. In 1943, for the first time, inquiries reached the Levante Station of Agricultural Phytopathology concerning the wheat foot rot caused by *Ophiobolus graminis*, which was found to cause widespread damage, notably to the popular Mentana and Ardito varieties, some fields being an almost total loss while the average reduction would amount to about one-third of the entire crop. The Fartó variety of *Triticum durum* seemed to be much more resistant.

A comparative analysis of four ears each from healthy and diseased plants showed the length of the former to range from 110 to 125 and of the latter from 69 to 95 mm., the number of seeds from 59 to 77 and from 18 to 30, respectively, while the average weights of the seed from the healthy and infected ears were 3·1187 and 0·1987 gm., respectively.

O. graminis is most prevalent on clay or clay-siliceous soils and thrives in the presence of excessive moisture, the accumulation of which in the upper layers may be obviated by a conservative system of irrigation, watering as a rule only once when the seedlings start rapid growth and again when the ears begin to expand. Other indirect control measures should include leaving a good growth of stubble, 20 to 30 cm. in height, for burning after the harvest, and two cross-ploughings to a sufficient depth to eradicate as much as possible of the roots and surrounding soil.

Thren (R.). **Über Zustandekommen und Erhaltung der Dikaryophase von Ustilago nuda (Jensen) Kellerm. et Sw. und Ustilago tritici (Persoon) Jensen.** [On the development and maintenance of the dikaryophase of *Ustilago nuda* (Jensen) Kellerm. & Sw. and *Ustilago tritici* (Persoon) Jensen.]—*Z. Bot.*, xxxvi, 10, pp. 449–498, 2 pl., 13 figs., 1941. [Received 1946.]

In this exhaustive cytological study the author fully describes and discusses the processes involved in the development and maintenance of the dikaryophase in

the loose smuts of barley and wheat (*Ustilago nuda* and *U. tritici*, respectively) [cf. *R.A.M.*, xvi, p. 804.]

JENSEN (N. F.). **Powdery mildew of Barley. Studies of yield losses and the inheritance of disease resistance.**—*Abstr. Thes. Cornell Univ.*, pp. 333–334, 1944. [Received April, 1947.]

Powdery mildew [*Erysiphe graminis*; *R.A.M.*, xxvi, p. 194] of barley threatens to cause serious harm to the crop, especially in New York State. The investigations were carried out with race 4 of the pathogen and extended over the three-year period, 1940–42, at Cornell University Agricultural Experiment Station. When sulphur dust was used as a protectant (20 lb. per acre), the reduction in yield in the susceptible varieties used was statistically significant, the losses in 1941 being 19, 15, and 10 per cent. and the greatest loss 5·8 bush. per acre. The 1942 statistically significant losses were 42, 38, 33, and 29 per cent. on the susceptible varieties, the greatest reduction being 23 bush. per acre. Resistant varieties showed no significant loss. A new physiologic race which attacks Goldfoil, highly resistant to race 4, is so far confined to the greenhouse where it appeared. Two crosses, resistant Goldfoil × susceptible Wisconsin No. 38 and Ohio No. 3144 × Goldfoil, were studied for resistance to race 4; resistance and susceptibility were found to depend on a single pair of factors, susceptibility being incompletely dominant [ibid., xxiv, p. 224].

MACFARLAN (J.) & GRAINGER (J.). **Corn mildew on Oats.**—*Scot. J. Agric.*, xxvi, 4, pp. 211–215, 1 pl., 1 graph, 1947.

Powdery mildew of oats (*Erysiphe graminis*) [*R.A.M.*, xxv, p. 403], which is occasionally very severe on cereals grown for green fodder in the west of Scotland, was considered in relation to the effects of climate, major factors of soil nutrition, and major constituents of the host plant.

Oats were grown on two sites with the same average temperature but having different relative air humidities, one being very humid (100 per cent. relative humidity for long periods). The crop on the latter site had three times as much mildew as that on the drier site. Spores germinated better in saturated air than in water or unsaturated air, while below 90 per cent. relative humidity they failed to grow [ibid., xxv, p. 280]. There was heavy mildew infection during the mainly fine summer of 1944, when, however, there were long periods of high relative humidity, and slight mildew during 1945 with mainly dull weather but low relative humidity for most of the growing period. A close relation was found between percentage infection and the number of hours of 100 per cent. humidity. The strains of *E. graminis* are specific to each type of cereal and probably have different climatic reactions.

Field experiments on phosphate-deficient soil of the effects of nitrogen, phosphate, and potash fertilizers [ibid., xxv, p. 523] showed that unbalanced applications of both nitrogen and potash increased mildew infection (from 14 to 26 per cent.), phosphate alone benefiting the crop by reducing mildew from 14 to 10 per cent. Pot experiments confirmed that it is only correction of phosphate deficiency which reduces the severity of the mildew, phosphate applications to normal soils having no effect.

The only point of interest emerging from the third problem was that oats appeared more susceptible to *E. graminis* when grown with eight hours' illumination per day than with the normal length of day.

It is recommended that manurings should be balanced and not excessive, serious phosphate deficiency corrected, and the oats grown in open, airy positions with low relative humidity.

EKSTRAND (H.). **Några växtpatologiska synpunkter på höstsädes- och vallodlingen i Norrland.** [Some phytopathological aspects of autumn cereal seed- and pasture grass-cultivation in Norrland.—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1946*, 5, pp. 68–73, 1946.

During the last few decades the cultivation of autumn cereal seed has declined to an unprecedented extent in the north of Sweden, but it could doubtless be rehabilitated by the introduction of varieties resistant to the fungal diseases responsible for winter injury. Rye was formerly much more widely grown than it is to-day, but the 'rustic' varieties in common use, though resistant to *Fusarium* [*Calonectria graminicola*], were of unattractive growth habit and relatively unproductive.

The cultivation of clover in the northernmost parts of the country is often considered impracticable, partly by reason of the poor state of the soil and partly on account of clover rot [*Sclerotinia trifoliorum*]. The resistance shown to the pathogen in the south by the Svalövs Merkur and Weibulls Resistenta selections has not been maintained elsewhere, indicating the predominance of different physiologic races in the various regions [*R.A.M.*, xxvi, p. 155].

Mention has already been made of the depredations caused by *S. borealis* among pasture crops in the far north [ibid., xxvi, p. 10]. In a test near Luleå in the spring of 1946 on 1945 meadow fescue [*Festuca pratensis*] seed of northern (Luleå) and southern (Svalöv) provenance, the incidence of infection by this fungus ranged from 11·5 to 15 per cent. for the former and from 22·5 to 52·5 per cent. for the latter. In a test on *F. rubra* of the same year the two southern (Scania) lots developed 31·5 and 35 per cent. infection and the two northern (Luleå) 10 and 9·1. *Typhula borealis* [loc. cit.], the sole pathogen of grasses in the same locality in 1945, was also more prevalent on timothy [*Phleum pratense*] of southern origin than on the north Bothnian selections. It is obviously advisable, therefore, that seed for pasture crops should be locally produced.

SABET (Y. S.). **Reaction of Citrus mycorrhiza to manurial treatment.**—*Proc. Egypt. Acad. Sci.*, i, 1, pp. 21–28, 6 figs., 1946.

Lime, sweet and sour orange, lemon, grapefruit, mandarin, and citron trees at Giza were found to harbour endotrophic mycorrhiza, which responded to the application of soil amendments similarly to those described by Reed and Frémont from California [*R.A.M.*, xiv, p. 710]. Farmyard manure stimulated the production of copiously branching arbuscules, which were scantier and smaller in the roots supplied with calcium nitrate and still further reduced in the untreated control rows.

The examination of chlorotic orange trees raised from seed revealed sparse endophytic infection compared with the extensive mycorrhizal investment of the cells in healthy roots and those of trees that had recovered from the disturbance following the injection of iron salts or the admixture of organic manure with the surrounding soil.

The views of other workers on the significance of the mycorrhizal association are summarized and discussed. Most of the papers referred to have been noticed from time to time in this *Review*.

DICKSON (R. C.) & JOHNSON (METTA McD.). **Insect investigations in relation to quick decline.**—*Calif. Citrogr.*, xxxii, 4, pp. 159, 162, 1947.

The work being carried out by the authors on the possible transmission of the virus of citrus quick decline [*R.A.M.*, xxvi, p. 242] by insects consists of a survey of the insects present in orange trees and which therefore might transmit the virus, an attempt to retard the spread of quick decline in an orange grove by the use of

insecticides, and transmission tests to determine which insect might be involved in spreading the virus. Results are not expected for 18 months at least.

SOBRINHO (V.). **A tristeza dos Citrus. Hipotese fisiológica.** [Citrus 'tristeza'. A physiological hypothesis.]—*Bol. Agric., Pernambuco*, xiii, 4, pp. 253–264, 1 fig., 1946. [English summary.]

Of the three symptoms of the 'tristeza' form of citrus root rot (which the author identifies with quick decline) [see preceding abstract], observed in north-eastern Brazil [see above, p. 287], namely, sieve-tube occlusion, root rot in the stock, and decay of the scion, only the first-named is a direct consequence of intervention by a virus or other extraneous agency, the rotting of the roots being a secondary effect and the decay of the scion a tertiary. The wood vessels both of stock and scion are sound, as also are the sieve-tubes, except in the grafting region where the occlusions occur.

The causal organism, if any, must therefore be sought in the sieve-plates or tissues adjoining the sieve-tubes round the juncture between scion and stock [cf. next abstract].

MENEGHINI (M.). **Sôbre a natureza e transmissibilidade da doença 'tristeza' dos Citrus.** [On the nature and transmissibility of the 'tristeza' disease of Citrus.] —*Biológico*, xii, 12, pp. 285–287, 1946.

The author tabulates and briefly discusses the results of experiments at the Biological Institute, São Paulo, Brazil, in the transmission of the 'tristeza' form of citrus root rot [*R.A.M.*, xxvi, p. 12 and preceding abstract] by means of the black orange aphid, *Aphis* (?) *tavaresi*. In 1945 the disease was conveyed by aphids collected on affected sweet orange plants to one out of four Pêra sweet orange scions on bitter orange stocks in a test performed on 20th February, clear-cut symptoms developing on 15th May; to one out of four in a test on 14th May with aphids from mandarin, the symptoms appearing on 30th August; to one out of five in a test on 6th June, in which the aphids were placed direct on the scions (symptoms on 6th September); to one out of two with aphids fed on a diseased sweet orange plant (21st July, symptoms 28th November); and to one out of 30 of the Caipira, Pêra, Barão, and Lima varieties with aphids from diseased sweet orange (6th November, symptoms 2nd February, 1946).

In a test on 2nd August, 1946, aphids from affected sweet orange plants transmitted the root rot to one out of two Pêra scions and to both those of Barão used, symptoms being observed on 16th December. Two out of three Caipira scions visited by aphids from sick mandarins on 2nd September also displayed root-rot symptoms on 16th December.

WALLACE (J. M.). **The use of leaf tissue in graft-transmission of psorosis virus.**—*Phytopathology*, xxxvii, 3, pp. 149–152, 1 fig., 1947.

In the inoculation of citrus with the psorosis virus by means of leaf-tissue grafts, resulting in 90 to 100 per cent. infection, the procedure is similar to that previously described by the author for the insertion of bark patches [*R.A.M.*, xxiv, p. 501]. The fusion of tissues was rapid, symptoms appearing on the inoculated seedlings in two to four weeks. Many of the leaf pieces were still living and of normal colour after 30 months under the bark, by which time they were buried in 3 to 4 mm. of wood.

HEIM (R.). **Une aspergillose du grain de Café.** [An aspergillosis of the Coffee berry.] —*C.R. Acad. Agric. Fr.*, xxxii, pp. 407–411, 1946.

From coffee (*Coffea arabica*) berries from Costa Rica with a soapy, whitish

appearance the author isolated an *Aspergillus* which from its cultural characters belonged to the *ochraceus* group and appeared to be referable to *A. tamarii*. The fungus develops on berries treated by the wet method, and since 1935 has been more and more prevalent on coffee from the same source. The disease appears to be induced by imperfect drying or excessive humidity during fermentation. As, according to the author, most of the fungi of this group cause pulmonary diseases which may prove fatal, it is considered that coffee berries infected by this organism should not be used.

ERGLE (D. R.) & BLANK (L. M.). **A chemical study of the mycelium and sclerotia of Phymatotrichum omnivorum.**—*Phytopathology*, xxxvii, 3, pp. 153–161, 1 graph, 1947.

The chemical composition of the sclerotia of *Phymatotrichum omnivorum*, the agent of cotton root rot [cf. *R.A.M.*, xxi, pp. 75, 287], was determined at four stages of growth in culture on (*a*) Houston Black clay, high-lime phase, (*b*) the same, low-lime phase, and (*c*) Wilson clay. The development of the sclerotia was found to be accompanied by a proportionate disappearance of reducing sugars and an accumulation of fat, protein, glucosans, and hemicelluloses. Parallel with a higher growth rate, glucosans and protein tended to accumulate in higher concentrations in sclerotia produced in the two Houstons than in the Wilson soil. Non-reducing sugars, pectin, pentosans, cellulose, and suberin were present in the sclerotia in relatively small amounts irrespective of the soil type.

The mycelium of *P. omnivorum*, cultured in a suitable nutrient solution, contained higher concentrations of fat, protein, and reducing sugars than the sclerotia but was materially less efficient than the latter in the storage of total carbohydrates (sugars plus glucosans plus hemicellulose). Ash, pectin, pentosans, cellulose, and suberin were also more abundant in the mycelium than in the sclerotia.

At neither stage in the life-history of the fungus was starch or sucrose present, whereas glycogen was identified both in the sclerotia and mycelium: a disaccharide, believed to be trehalose, occurred in the former only. Apart from small quantities of pentosans, the polysaccharides in both phases seemed to consist mainly of polymers of glucose.

YANG (J. Y.) & LING (L.). **Diseases of Cotton in Szechuan.**—*Bull. Szechuan agric. Improvement Inst.* 1, 12 pp., 7 figs., 1942. [Chinese. Received 1946.]

According to a survey made from 1937 to 1941, 19 diseases attacking cotton were found in Szechuan [*R.A.M.*, xxiv, p. 100]. These, in the order of destructiveness, are as follows: bacterial blight (*Bacterium* [*Xanthomonas*] *malvacearum*), anthracnose (*Glomerella gossypii*), *Fusarium* boll rot (*F.* spp.), *Diplodia* boll rot (*D. gossypina*), stem canker (cause unknown), sore shin (*Rhizoctonia* [*Corticium*] *solani*), stem blight (*Alternaria macrospora*), *Colletotrichum* boll rot (*C. indicum*), *Alternaria* leaf spot (*A.* spp.), *Phyllosticta* leaf spot (*P. gossypina*), areolate mildew (*Mycosphaerella areola*), wilt (*F. vasinfectum*), sclerotial stem rot (*Sclerotium rolfsii*), *Mycosphaerella* leaf spot (*M. gossypina*), *Cephalothecium* boll rot (*C.* [*Trichothecium*] *roseum*), *Aspergillus* boll rot (*A.* sp.), and *Phytophthora* boll rot (*P.* sp.).

Detailed records of the distribution and relative prevalence of each disease in different seasons are given. A key for field identification is provided. The loss of seed cotton due to the important diseases was estimated at approximately 5,250 metric tons in 1938, 2,200 in 1939, and 5,000 in 1940.

Varietal resistance towards bacterial blight and anthracnose were recorded, and a list of resistant varieties, mostly Chinese, is given.

LING (L.), FOO (C. F.), LIN (H. D.), & WANG (H. C.). **Combating Cotton diseases in Szechuan.**—*Rep. Szechuan agric. Improvement Inst.*, 12 pp., 1 fig., 1942. [Chinese.]

From 1939 to 1941, the control of cotton diseases in northern Szechuan was carried out by spraying with Bordeaux mixture twice during the growing season in July and August. The results obtained from 81 demonstration plots during the three-year period showed that the spraying effected an average increase of yield of 14·8 kg. seed cotton per shih mow [1 shih mow = $\frac{1}{6}$ acre] over the check at a cost of about $\frac{1}{5}$ of the gain.

GORLENKO (M. V.). **The toxins of moulds.**—*C.R. Acad. Sci. U.R.S.S.*, liv, 5, pp. 449–451, 1946.

Besides *Strachybotrys alternans*, the agent of a virulent disease of horses in the Ukraine [*R.A.M.*, xxiv, p. 276], nine other ubiquitous moulds obtained from the air of cotton mills, from cotton-wool, and fodder samples, including *Alternaria tenuis* and *Macrosporium* [*A.*] *gossypii*, were experimentally shown to be more or less pathogenic to rabbits. Though the toxicity of the other organisms is lower than that of *S. alternans*, their growth is more rapid and prolific. The minimum doses of toxin of *S. alternans* required to induce slight and severe lesions, respectively, in rabbits' eyes were 0·0000064 and 0·00016 [? gm.] of the dry substance extracted, respectively. All the toxins are readily soluble in acetone, ether, alcohol, and dichlorethane, but not in water. They are endotoxins, confined within the mould itself and not diffusing into the substratum, a matter of some practical importance, inasmuch as contaminated fodder can be freed from the superficial moulds and rendered fit for consumption, e.g. by washing.

DOTY (M. S.) & SLATER (D. W.). **A new species of Heterosporium pathogenic on young Chinook Salmon.**—*Amer. Midl. Nat.*, xxxvi, 3, pp. 663–665, 1 fig., 1946.

In California *Heterosporium tshawytschae* n.sp. has been isolated from kidney mycoses of yearling chinook salmon (*Oncorhynchus tshawytscha*). The mycelium forms dark brown plaques of pale brown immersed hyphae, with hyaline, marginal and erect hyphae; they are cylindrical, smooth, variable in size, (1·5) 2 to 4 μ in diameter, and sometimes irregularly swollen. The cells are 16 to 20 μ long, often with swollen ends and constricted septa. The conidia, usually arising as sessile, lateral branches either from conidiophores or directly from superficial hyphae, are low-tuberculate, triseptate at maturity, elliptic-oblanceolate, and measure 14 to 20 by 4 to 6 μ. The four locules are equal, cylindrical or slightly swollen, and the apex hemispherical.

This species of *Heterosporium* is distinguished by the small, sparsely scattered warts on the spore surfaces and by the almost constant production of quadrilocular spores, which are small for the genus.

Although the fungus may destroy the kidneys entirely it is thought that its importance as a fish pathogen is slight.

RAYCHAUDHURI (S. P.). **A note on mosaic virus of Sann-Hemp (Crotalaria juncea Linn.) and its crystallisation.**—*Curr. Sci.*, xvi, 1, pp. 26–28, 4 figs., 1947.

A mosaic disease of sann hemp (*Crotalaria juncea*) prevalent at Delhi in the early part of 1946 was characterized by foliar mottling, stunting, and (in severe cases) malformation, the dark green patches alternating with pale ones on the upper surface often being raised, with a corresponding depression on the under side. The microscopic comparison of healthy and diseased leaf sections revealed that the mesophyll tissues are thinner, with fewer intercellular spaces, in the chlorotic areas of the infected foliage, while differentiation into palisade and spongy parenchyma is lacking at an advanced stage; the cells are roughly isodiametric in

transverse section and their chloroplasts somewhat indistinct. The vascular tissue of the mottled leaves showed only occasional hypertrophy of a few of the phloem cells.

The virus proved to be transmissible by rubbing healthy plants with sap from diseased ones, the typical symptoms developing within six to eight days of inoculation: when the young leaves were punctured with insect needles dipped in the inoculum the mosaic appeared after three to four days. The control plants similarly treated with distilled water remained healthy. The thermal death point of the virus was found to lie between 68° and 70° C., its longevity *in vitro* to cover a period of 71 to 76 days, and its tolerance of dilution to range from 1 in 1,000 to 1 in 5,000. The sann-hemp mosaic virus was not transmissible to cowpea, nor could the locally widespread cowpea mosaic virus be communicated to *C. juncea*. Dale concluded from the intertransmissibility of the viruses of these two plants in Trinidad that the causal agent was identical [*R.A.M.*, xxiii, p. 203], in which case the Delhi disease is evidently of different origin. No experiments were reported by Fukushi on *C. juncea* mosaic in Japan [ibid., xi, p. 797], so it is difficult to form an opinion as to its connexion with the virus disease of the same host in India.

A solution of the very fine, acicular crystals resulting from purification of the virus by Bawden's method [ibid., xxiv, p. 137] induced typical symptoms of the disease.

Grente (J.). **Une maladie du Lin due à Aschochyta linicola.** [A disease of Flax caused by *Ascochyta linicola*.]—*Ann. Épiphyt.*, N.S., xii, 2, pp. 81–90, 3 figs., 1946.

In May, 1945, specimens of flax sent to the author from Normandy showing symptoms of dryness at the base of the stem and brown coloration for about 5 or 6 cm. yielded a fungus later identified as *Ascochyta linicola* [*R.A.M.*, xxv, p. 526]. This fungus is entirely new to France, and possibly attacks previously attributed to *Phoma exigua* [ibid., viii, p. 151] were really due to this species, especially as the spores of *A. linicola* in the earlier stages are similar to those of *P. exigua*.

The results of experiments not yet complete suggest that contaminated soil does not retain its infectivity for very long [cf. ibid., xi, p. 647], but further experiments on the overwintering of the parasite are being conducted. The disease is not unlike the serious malady known as 'mort-lin' and experiments to test its possible identity with this disorder are in progress.

Barthelet (J.). **Le mildiou de l'Œillet.** [Carnation mildew.]—*C.R. Acad. Agric. Fr.*, xxxii, 13, pp. 575–577, 1946.

A severe attack of mildew (*Peronospora dianthicola* n.sp. [without a Latin diagnosis]) on double perpetual carnations in frames attributed to the exceptionally wet spring of 1946 was brought to the notice of the Botanical and Phytopathological Station, Antibes. It appeared on the leaves and stems of young cuttings as pale green areas turning to yellow and they finally withered. The conidia rapidly appeared mainly on the under side of the leaf as a violet-grey coating. The thick conidiophores emerging four or five at a time from the stomata were 280 to 300 μ long. The pale violet conidia measured 23·8 by 17·78 μ. The numerous oospores with a thick epispore coated with vermiculate warts were 39 μ in diameter. This species differs from other *P.* spp. on related plants in the size of the conidia and oospores and in the ornamentation of the epispore. The mildew had developed on carnations of the Antibes variety and a considerable range, from total resistance to complete susceptibility, was noticed among its different strains, an important point being the extreme susceptibility of the yellow-flowered forms.

The percentages of diseased plants among other varieties were: Marie Chabaud, Étincelant, 100; Légion d'Honneur, Enfant de Nice white, 80; La Perle, 30;

Magenta, 10; Aurore, Reine pink, Enfant de Nice mauve, 5; Enfant de Nice clove, Enfant de Nice red, 0.

Copper treatments in the right season are hoped to give good preventive results.

McClellan (W. D.) & Stuart (N. W.). **The influence of nutrition on Fusarium basal rot of Narcissus and on Fusarium yellows of Gladiolus.**—*Amer. J. Bot.*, xxxiv, 2, pp. 88–93, 1 fig., 4 graphs, 1947.

Bulbs of King Alfred narcissus [daffodil: *Narcissus pseudo-narcissus*] dipped in aqueous solutions or talc mixtures of indolebutyric acid, naphthalene acetic acid, naphthalene acetamide, transplantone (consisting largely of sucrose, uric acid, and naphthalene acetamide), allantoin, guanidine, uric acid, or nucleic acid before planting in the field at the Plant Industry Station, Beltsville, Maryland, contracted more basal rot (*Fusarium oxysporum* f. *narcissi*) [*F. bulbigenum*] than those dipped in water or untreated [*R.A.M.*, xxii, p. 169]. The adverse effect of naphthalene acetamide (0·01 per cent.) was overcome by the addition of thiosan (1 lb. in 8 gals. water) to the dipping solution after harvest or before planting, or on both occasions. The following percentages of rotted bulbs occurred in the lots given the different treatments: thiosan alone after harvest, 3; thiosan plus 1 per cent. naphthalene acetamide after harvest, 2·3; naphthalene acetamide after harvest, 59·1; thiosan plus naphthalene acetamide after harvest and before planting, 1·8; naphthalene acetamide after harvest and before planting, 44·9; and controls, 22·6.

Texas-grown Sheila gladiolus corms supplied with an organic nitrogen fertilizer derived from blood tankage (160 lb. per acre) produced fewer flowers and corms and developed a higher incidence of rot (*F.o.*f. [var.] *gladioli*) [ibid., xxiv, p. 418] than those in comparable plantings receiving an inorganic nitrogen soil amendment or none. Thus, the total numbers of corms harvested from plots 25 ft. long treated with organic nitrogen, inorganic nitrogen, and untreated were 274, 390, and 352, respectively, the corresponding corm weights being 10·7, 25, and 21·9 lb., respectively, and the numbers of flowers cut, 17, 392, and 316, respectively; the reductions in the organic-nitrogen series were attributed to the effects of the disease.

The growth of cultures of *F. bulbigenum* in a modified Steinberg complete nutrient solution was promoted by the addition of five growth-regulators, viz., naphthalene acetamide, indolebutyric acid, uric acid, allantoin, and adenine sulphate, and purines in amounts ranging from 0·1 to 100 mg. per l. Field-grown daffodil bulbs supplied with factorial combinations of nitrogen, phosphorus, and potassium contracted the maximum and minimum incidence of basal rot where the first- and last-named elements only were used (605 and 498 rotten bulbs, respectively, out of 2,400). In nutrient solutions the mycelium of *F. bulbigenum* grew most profusely at the maximum nitrogen level.

In Picardy gladiolus corms grown in sub-irrigated greenhouse nutriculture benches *F.o.* var. *gladioli* was most prevalent (134 diseased out of 1,760) when a nutrient solution high in nitrogen and low in phosphorus was applied, and least so (13) where equal quantities of the three fertilizers were given.

It is suggested that the increased incidence of daffodil rot following the use of organic nitrogen soil amendments is largely due to the presence in the latter of purines, and further that the extensive substitution of organic for inorganic fertilizers by commercial gladiolus-growers during the war contributed significantly to the spread of *F.o.* var. *gladioli*. The writers are not aware of any previous reports on the use of synthetic hormones or nitrogen bases as an actual factor in the increase of plant-disease losses, but various references have been made to the value of such products as stimulants to the growth of micro-organisms, and a similar observation now applies to the action of adenine, uric acid, and allantoin on *F. bulbigenum*.

ANDRÉN (F.). **Betningsförsök med Lupinfrö 1946.** [Lupin seed disinfection experiments in 1946.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 6, pp. 91–93, 1946.

In preliminary experiments to determine the relative efficiency of certain fungicides in the control of *Botrytis* [*cinerea*] on lupin [*R.A.M.*, xxii, pp. 161, 360] seed, U.T. 1875 b (200 to 600 gm. per 100 kg.) gave the best results, reducing the incidence of infection from 24·8 to an average of 11·6 per cent. The corresponding figures for panogén (200 to 600 ml.) and betoxin 61 (200 to 600 gm.) were 17·2 and 20·4 per cent., respectively. Tetramethyl thiuramdisulphide [Du Bay 1205—FF], included in the field trials, proved superior to any of the foregoing, the percentages of diseased plants in the plots treated with this compound at 200 and 400 ml. being 6·9 and 19·3, respectively, compared with 38·8 and 20·9, 36·5 and 23·7, and 14·6 and 18·2, respectively, for equivalent dosages of betoxin 61, panogén, and U.T. 1875 b.

CUNNINGHAM (G. H.). **Cause and prevention of silver leaf in orchards.**—*N.Z. J. Agric.*, lxxiv, 2, pp. 137–139, 8 figs., 1947.

This is an account in popular terms of the symptoms, life-history, and preventive treatment for silver leaf, *Stereum purpureum* [*R.A.M.*, xxiv, p. 153]. It is widespread in New Zealand orchards, causing about 1 per cent. loss among apple trees, over 10 per cent. on peach, and even more on plum. It also attacks almond, apricot, cherry, nectarine, pear, and quince trees, and currant and gooseberry bushes, as well as cultivated ornamental shrubs and trees such as laburnum, lilac, poplar, silver birch, and willow [*Salix*]. It has not been found on indigenous plants. The fungus is spread solely by means of spores, no infection being caused through secateurs used in pruning operations.

LEWIS (F. H.). **Studies on spray and dust schedules for control of Apple scab in Western New York.**—*Abstr. Thes. Cornell Univ.*, pp. 335–338, 1944. [Received April, 1947.]

An attempt was made to find a non-injurious spray to replace lime-sulphur for the control of apple scab (*Venturia inaequalis*) [cf. *R.A.M.*, xxvi, p. 202] which is very prevalent in New York [State]. Lime-sulphur solution at 2–100, and at 1¼–100 alone or plus magnetic catalytic sulphur at 4–100, and flotation sulphur paste at 7–100 all gave good control but were not dependable for complete elimination of scab. These results were for the two varieties McIntosh and Rhode Island Greening over a four- and three-year period respectively. It was found in 1942 that magnetic-70 sulphur paste gave better results than the other elemental sulphurs and the same applied to flotation sulphur paste among the dry wettable sulphurs. Fermate plus hydrated lime gave excellent scab control on the leaves but was less effective on the fruit. Of the fungicide-lead arsenate combinations lime-sulphur 2–100 in the sprays before bloom, followed by flotation sulphur paste in the first two after bloom, then Bordeaux mixture in the cover sprays with hydrated lime in all the mixtures, was found to cause less leaf injury than other sulphurs or concentrations of lime-sulphur. Lime-sulphur in the cover sprays seemed to cause greater pre-harvest fruit drop than other materials, and in 1942 caused a 32 per cent. reduction in picked fruit. Lime-sulphur 2–100 in the summer slightly decreased fruit size and tended to cause poorer development of colour while finer sulphurs left spotty deposits in late summer. Sulphur dust gave the best colour development. Fungicides applied while the trees were in bloom tended to decrease the set of fruit on the McIntosh and Cortland varieties and sometimes affected the yield as well; Bordeaux mixture or copper-lime dust at this period caused russeting.

Leaf injury was serious when sulphur was used with oil or within 25 days preceding oil. Dusts applied to apples in Wayne County after the beginning of a

rainy period but before invasion by the scab pathogen gave excellent control. Some adhesives showed promise and can be added to sulphur-lead arsenate dusts quite cheaply.

Vanderwalle (R.). **Biologie de la tavelure du Poirier.** [The biology of Pear scab.] —*Fruit belge*, xiv, 66, pp. 67–69, 1946.

In this paper the author gives a succinct account of the biology of *Venturia pirina* [*R.A.M.*, xxv, p. 506; xxvi, p. 158], the conidia of which are able to survive the winter, thus increasing spring infection. Ascospore maturation generally lasts from about 18th April until 12th June, the period in Belgium being longer than in regions with a continental climate. Flower infection is infrequent in Belgium and the first phase of scab development generally appears later on pears than apples.

Estienne (V.) & Soenen (A.). **La moniliose des arbres fruitiers à noyau.** [Moniliosis of stone-fruit trees.]—*Fruit belge*, xiv, 66, pp. 70–80, 2 figs., 1 graph, 1946.

In this study of brown rot of fruit trees in Belgium (in which the economic importance of the disease, and its symptoms, causal organisms, and their nomenclature are reviewed) the authors state that the organisms causing the condition there appear to be *Sclerotinia fructigena*, producing, chiefly, fruit rot of pip and stone fruits, *S. cinerea* f. *mali* [*S. laxa* f. *mali*], causing blossom wilt of pip and stone fruits, particularly on Morello cherries, *S. cinerea* f. *pruni* [*S. laxa*], causing fruit rot and blossom wilt of stone fruits, and *S. laxa* on apricots, which can be regarded as a special form.

Under Belgian conditions, the control of *S. laxa*, particularly f. *mali*, would appear to be even more urgent than that of *S. fructigena*. The former occurs chiefly on cherries, particularly the acid varieties, this host not receiving pre-floral fungicidal applications. In recent years, attack by *S. laxa* has attained epidemic proportions on Morello cherries, and in the Campine certain plantations on light soils are being destroyed by the disease. In the north, damage takes the form of blossom wilt (*S. laxa* f. *mali*), which attacks whole branches and even entire trees, killing them off in a few days. Shortly after blossoming, the affected branches and some of the flowers, which have withered on the tree, become covered with mycelium. Fructifications were frequently found on withered leaves. No infection of peach leaves by *S. laxa* was observed by the writers. Branch infections are considered to follow attacks by other organisms. The flowers are usually badly attacked.

Service and regulatory announcements. List of intercepted plant pests, 1945.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 47 pp., 1946.

Among the pathogens intercepted on plant material entering United States territory during the period from 1st July, 1944, to 30th June, 1945, inclusive [cf. *R.A.M.*, xxiv, p. 128], were *Bacterium* [*Xanthomonas*] *citri* [cf. *I.M.I. map*, No. 11] on grapefruit and *Phoma citricarpa* on oranges and lemons from Australia [*R.A.M.*, xxiii, pp. 104, 175], *Elsinoe australis* on orange and lemon from Brazil [ibid., xxii, p. 176], *Sclerotinia fructigena*, not known to occur in the United States [ibid., vi, p. 619], on an apple in stores from Portugal, and *Cladosporium pisicola* on peas, originally described from California [ibid., xiv, p. 71], also in stores from Portugal.

Nye (G. W.). **Summary of legislative changes.**—*Rep. Dep. Agric. Nyasald, 1945*, Part I, p. 12, 1947.

Government Notice No. 44 of 1945 amends the schedules to the Plant Pests and Diseases Ordinance [*R.A.M.*, xvi, p. 80] by the addition of tomato seeds to the first and of tomato bacterial blight [*Corynebacterium michiganense*] to the second.

IMPERIAL MYCOLOGICAL INSTITUTE

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ROOS (K.). **Das Kirschbaumsterben im Baselland. 3. Mitteilung: Infektionsversuche und Bodenuntersuchungen.** [The dying of Cherry trees in the Basle district. Note 3: inoculation experiments and soil analyses.]—*Annu. agric. Suisse*, lx, 5, pp. 500–520, 1946. [French summary.]

The late author's inoculation experiments in 1937 with fungi, bacteria, and dried leaf tissue from affected trees yielded no clue as to the cause of the dying-off of cherry trees in the Basle district of Switzerland [*R.A.M.*, xviii, p. 692], and negative results were also obtained in grafting tests with diseased scions and from the injection of juice from moribund trees. On the other hand, large-scale soil analyses indicated that nutrient deficiency might be the source of the trouble. This supposition was confirmed by K. Meier's unpublished data relating to subsequent researches on this unfinished project.

JENKINS (ANNA E.). **A new species of Elsinoë on Capulin cherry.**—*J. Wash. Acad. Sci.*, xxxvii, 3, pp. 86–89, 1 fig., 1947.

A technical diagnosis is given of *Elsinoe pruni* n.sp., the agent of conspicuous, circular to subcircular, coalescent lesions, up to 5 mm. in diameter, vinaceous-buff above and brown to purple below, first observed in 1940 on the leaves of a capulin cherry (*Prunus capuli*) [*P. serotina salicifolia*] tree lately introduced into the Central Experiment Station, Caracas, Venezuela, from Mexico. The asci are subglobose to broadly ovoid or piriform, 22 to 30 by 16 to 22 μ, and the ascospores fusiform to elliptical, straight or slightly curved, triseptate, hyaline, 14 to 18 by 6 to 8 μ. The imperfect state, *Sphaceloma pruni* n.sp., is characterized by a palisade usually at least 14 μ in thickness, of dark-coloured, continuous or septate, rarely geniculate conidiophores, 3 to 5 μ in diameter, and spherical to narrowly ovoid or fusiform-elliptical, fuscous conidia, up to 15 by 2·6 to 5 μ.

WEAVER (L. O.). **Effect of temperature and relative humidity on occurrence of blossom blight of stone fruits.**—*Abstr. Thes. Cornell Univ.*, pp. 351–353, 1944. [Received April, 1947.]

Blossom blight of stone fruits (*Prunus* sp.) caused by *Sclerotinia fructicola* [cf. *R.A.M.*, xxi, p. 145; xxvi, pp. 97, 111] is occasionally very serious in New York State. Greenhouse observations were made on potted two- to three-year-old peach or cherry trees, with inoculated blossoms. The germination of the conidia of *S. fructicola* occurred more rapidly on floral parts, particularly on the stigmatic exudate than on potato dextrose agar or glass slides. Contact with water was essential to germination. Conidial germination and mycelial growth occurred at temperatures ranging from 5° to 30° C. with best results at 20° to 25°. Relative humidities above 85 per cent. were needed for spore production; growth was continuous on the agar plates at relative humidities above 96 per cent. *S. fructicola* infected peach blossoms within 18 hours at 10°, 8 to 12 at 15°, 11 at 20°, and 5 at 25° when started in a saturated atmosphere and later removed to one of 40 to 100 per cent. relative humidity, 80 to 90 per cent. being the optimum for

infection. Actual blighting occurred, however, only after a second period in a saturated atmosphere, the lesions becoming dry at 80 per cent. humidity. All floral parts were susceptible and open flowers blighted more readily than those in the pink stage. The percentages of blight on blossoms in the pink stage at 90, 80, and 70 per cent. relative humidity were 43, 27, and 20, respectively. At high humidities infection and blight occurred readily, especially when the stamens and pistil were exposed.

During experiments to determine at what stage of the young developing peach fruit the danger from blossom infection is past it was found that lesions appeared on all floral parts inoculated on the third to tenth day after pollination, but there was only a small percentage of infection on the young fruit when five days had elapsed between pollination and inoculation. A peduncle rot occurred on small green fruits nine and twelve days after pollination after 40 hours in a saturated atmosphere at 19°. Unfertilized fruits blighted readily in all cases.

ORTON (E. C.). **Treatment of iron chlorosis in Currants.**—*Aust. Dried Fruits News*, xxi, 11, p. 5, 1946.

Progress has been made at the Commonwealth Research Station, Merbein, Victoria, in the treatment of iron chlorosis of currants, which occurs periodically on some of the more alkaline 'mallee' [*Eucalyptus*] soils, by the application to pruning cuts, immediately after the operation, of a 20 per cent. iron sulphate solution. Cincturing cuts may be similarly treated. Shallow rooting should be encouraged, and cover crops should not be turned in until after the second irrigation, preferably by rotary hoeing.

TILEMANS (E.). **Les pulvérisations en arboriculture fruitière. (Appareils — conditions de traitement — produits.)** [Spraying in relation to fruit-tree growing. (Machines—conditions of treatment—materials).]—*Fruit belge*, xiii, 63, pp. 122–130, 1945. [Received April, 1947.]

The most serious disease of apples and pears in Belgium is scab [*Venturia inaequalis* and *V. pirina*, respectively], which lowers the value of about one-quarter of the yield, on an average, in addition to causing losses in storage. Various aspects of the problem of spraying are discussed, including the general arrangement of orchards, how to calculate the amount of fluid delivered by a spray, and how much liquid is required, loss of liquid during spraying, the employment of the spray gun, the training of labour, and the use of dusts.

KOVACHE (A.) & FICHEROULLE (H.). **Sur l'utilisation des produits mouillants et des adhésifs comme adjuvants aux bouillies agricoles.** [On the utilization of wetters and stickers as adjuvants for agricultural mixtures.]—*Ann. Épiphyt.*, N.S., xi, 3–4, pp. 235–243, 1945. [Received April, 1947.]

Details are given of tests carried out with various commercial adhesives in France, which showed that as a general rule the materials in question are simply wetters, the effect of which, if they are used at high dosages, is to reduce the tenacity of the deposits. Only a few thousandth parts of these materials are required to increase the wettability of a mixture, i.e., its initial retention; at such dosages there is no effect on the final tenacity of the deposit. No adverse effect on initial retention resulted from high dosages, but weak ones are clearly indicated. Certain emulsified oils greatly increased the tenacity of the deposits without having any marked effect on wettability. For example, materials containing 83 per cent. mineral oils and 17 per cent. emulsifier used at 2·5 or 5 per cent., or 95 per cent. anthracene oil without phenols and made miscible with Bordeaux mixture by means of 5 per cent. of emulsifier and used at 6 or 10 per cent., or a material containing 80 per cent. white mineral oil of emulsified paraffin-type used at 1 or 2 per

cent., one containing 52 per cent. coal oil and 15 per cent. anthracene oil emulsified with 20 per cent. colophane soap and used at 1 or 5 per cent., all made the adhesiveness of Bordeaux mixture nearly perfect under the experimental conditions. The last two markedly improved the poor adhesiveness of arsenical mixtures.

TURNBULL (J.). **'Automatic' fruit tree spraying.**—*J. Minist. Agric.*, liv, 1, pp. 36–37, 1947.

A description is given of nozzle arrangements for 'automatic' spraying from a tractor in orchards [*R.A.M.*, xxv, p. 567 and preceding abstract]. This method failed earlier because the machines were too small, but it is successful now that the Ministry of Agriculture has supplied large mobile oufits for use by War Agricultural Committees and some growers have obtained larger machines. The nozzle which is kept stationary after adjustment is most popular and simpler than the moving device. A table of output requirements is given, the 20 gal. per minute machine being the most suitable for bush trees, while for trees larger than 30 ft. across the 40 gal. per minute machine must be used, though the 20-gal. is adequate if all nozzles are directed to one side.

For bush trees six single nozzles a side with No. 4 disks, spaced 9 in. apart, or three double 1 ft. apart are required; for half-standards six to ten single nozzles with No. 5 disks or eight with No. 6 disks all spaced $4\frac{1}{2}$ in. apart or half the number of double nozzles 9 in. apart. Seven-hole swirl plates and $\frac{1}{4}$-in. washers are necessary for the larger trees. When the correct fittings have been inserted to carry the spray effectively the nozzles are adjusted to give a complete fan of spray.

HAMBLIN (D. O.). **Toxicology of insecticides and fungicides.**—*Agric. Chemicals*, i, 6, pp. 28–31, 1946.

The author draws attention to the danger to human beings attendant upon the use of certain chemicals as insecticides and fungicides. After citing a definition of 'poison', he shows how poisons act upon the human body and describes the effects of a few poisons used in plant-disease control upon the different organs of the body. The only approach to the difficult problem of assaying toxicity is by experiment upon animals. This method is briefly described, with an indication of the expense involved, and the author concludes that with the information so obtained, products can be intelligently labelled so that they may be safely used. The [American] Manufacturing Chemists' Association has recently completed carefully worked out recommendations for the standard labelling of all chemical compounds at present marketed, and the hope is expressed that this uniform code will be adhered to by all firms concerned. The same organization is now preparing detailed bulletins for the safe handling of toxic products, including remedial measures.

MILES (G. F.). **300 years of chemical seed treatment.**—*Agric. Chemicals*, i, 7, pp. 22–25, 46, 3 figs., 1946.

The author briefly reviews in popular terms the history of seed treatments against fungal and bacterial diseases of plants from before the time of Du Tillet (1775) up to the present. He discusses the properties that a desirable seed disinfectant should possess, and touches upon future prospects. He describes the slurry or aqueous-suspension method of treating maize seed in which the amount of water applied to the seed is only about 0·5 per cent. of the weight of the seed, or about $\frac{1}{4}$ pt. water per bush. The treated seed is not even noticeably damp. The method employs water merely to facilitate the coating of the seed with the disinfectant. The substitution of water for talc or other inert powder fillers has two great advantages, in that it eliminates flying dust and ensures accuracy of dosage. The treating

machine synchronizes the flow of seed, so that each unit of maize receives the appropriate amount of suspension.

NELSON (A.). **Principles of agricultural botany.**—xvii+556 pp., 145 pl. (17 col.), 76 figs., 79 diags., 26 graphs, 1 map, London, Edinburgh, &c., Thomas Nelson & Sons, Ltd., 1946. 35*s*.

Comprised in this valuable treatise are references to various subjects of phytopathological interest, including mineral deficiencies, mycorrhiza, pathological conditions of environmental origin, virus and fungal diseases, and plant-breeding.

SKINNER (C. E.), EMMONS (C. W.), & TSUCHIYA (H. M.). **Henrici's Molds, Yeasts and Actinomycetes.**—xiv+409 pp., 136 figs., New York, J. Wiley & Sons, Inc., London, Chapman & Hall, Ltd., 1947. $5.00.

This book is a revision of Henrici's original work [cf. *R.A.M.*, x, p. 257] completely rewritten by the above three authors aided by Henrici's own notes. There is an addition of three entirely new chapters and some portions of the original are deleted. The stress on medical and industrial applications of mycology has been intensified and the discussions of life-cycles in the first chapter expanded. The three new chapters are on antibiotic substances, pathogenic yeast-like fungi, and variations in the lower fungi, while fungus diseases of man and animals has been expanded into two chapters.

ZOBELL (C. E.). **Marine microbiology. A monograph on hydrobacteriology.**—xv+240 pp., 1 fig., 6 diags., 6 graphs, Chronica Botanica Company, Waltham, Mass., 1946. $5.

This treatise, to which a foreword is contributed by S. A. Waksman, represents an attempt to summarize and correlate the extensive literature on marine microbiology, and comprises chapters on aquatic yeasts and moulds (IX); the relation of marine bacteria to flora and fauna (XIV), with a note on some destructive fungal pathogens of fresh-water fish and other animals; and the economic importance of marine micro-organisms (XVII), including those responsible for the decay of cordage and fishing-nets [cf. *R.A.M.*, xv, p. 505 *et passim*]. A 22-page bibliography is appended.

SARASOLA (A. A.). **Un método práctico para el cultivo aséptico de plantas.** [A practical method for the aseptic cultivation of plants.]—*Bol. Soc. argent. Bot.*, i, 4, pp. 303–311, 2 figs., 1946.

Seedlings of numerous species of plants were grown on a medium of sterilized garden soil in test tubes, 20 by 2·5 cm., light and heat being provided by 100-watt electric lamps, and used with successful results in inoculation experiments with species of *Cercospora*, *Botrytis*, *Ovularia*, *Albugo* [*Cystopus*], *Melampsora*, and *Ascochyta*.

DORRELL (W. W.) & PAGE (R. M.). **The use of fragmented mycelial inoculum in the culture of fungi.**—*J. Bact.*, liii, 3, pp. 360–361, 1 diag., 1947.

Using a Waring 'blendor', on which the normal vessel was replaced by a 1-qt. 'duraglass' fruit jar cut to hold the blending blades and connected with a culture bottle containing a well-developed mycelium of the particular fungus required as inoculum, the writers obtained substantial quantities of aseptic material for this purpose by passage through the jar in 200- to 300-ml. lots, one minute's mincing, and passage out into a dispensing vessel. In mass liquid cultures of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] the replacement of spores by 1 per cent. minced mycelial inoculum resulted in a twofold increase in the yield of mycelium

in two-thirds the time. By one minute's mincing of 50 ml. of a five- to six-day-old mycelial culture of *Gibberella zeae* in a shaker flask, approximately 1 to 1·5 by 10^6 mycelial fragments per ml. were obtained and found, after aseptic centrifuging and washing, to consist of 3- to 10-cell units, completely viable and capable of germination at many points. Inoculation with 2 per cent. of such a preparation gave a maximum mycelial yield.

GUPTA (B. M.). **A method of sealing tubes of fungal cultures to increase their longevity.**—*Curr. Sci.*, xvi, 3, pp. 94–95, 3 figs., 1947.

This new method tested in New Delhi enables fungus cultures in tubes to remain viable for at least eight months at room temperature. Pieces of cellophane, sufficient to cover part of the test tube wall as well as the mouth, are sterilized with alcohol. An aqueous solution containing 15 per cent. gelatine and 2 per cent. copper sulphate is used as an adhesive [cf. *R.A.M.*, xxvi, p. 22]. The tube is first plugged with cotton-wool while the culture is growing, this is then removed aseptically after about a week, the mouth dipped in the gelatine solution, sealed by the cellophane, and finally dipped in hot paraffin wax, the process being completed in only 15 seconds. The growth of the fungus is checked but is resumed when the seal is replaced by a cotton-wool plug.

MCCARTNEY (J. E.). **Culture media and the cultivation of micro-organisms.**—*J. Quekett micr. Cl.*, Ser. 4, ii, 3, pp. 132–142, 2 figs., 1946 (issued 1947).

This semi-popular account includes a description of the methods devised by the author, and used in the medical services during the war, for the centralized preparation of culture media and their despatch to the allied armies overseas. Test tubes and flasks, too fragile for this purpose, were replaced by bottles of suitable forms and sizes, closed by aluminium screw-caps with rubber washers. Bottles of ¼- and ½-oz. capacity were used for individual slants, larger sizes for plates, and 4- and 10-oz. bottles for agar in bulk. 'Tubed' media do not dry up in these bottles during prolonged storage before use. The different media were distinguished either by bands of cellulose paint of various colours on the caps or by coloured glass beads, one bead being placed with the medium in each container.

MILLER (J. J.), KOCH (L. W.), & HILDEBRAND (A. A.). **A comparison of cultural methods for the maintenance of certain economic fungi.**—*Sci. Agric.*, xxvii, 2, pp. 74–80, 1947.

This account deals with the maintenance of fungus cultures in tubes of sterilized soil as compared with the usual laboratory method of serial transfers on a nutrient-rich agar medium with regard to preventing loss of original strains through mutation. The fungi studied were *Thielaviopsis basicola*, *Septoria glycines*, *Penicillium notatum*, and the muskmelon *Fusarium* [*F. bulbigenum* var. *niveum*: *R.A.M.*, xxvi, p. 218]. Three media, potato dextrose agar, soil infusion agar, and moist sterilized soil, were used, the agars being dispersed in test-tube slants and the soil added to test tubes to within an inch of the top. Suspensions from young, growing, single-spore cultures were prepared in sterilized, distilled water, and were thus introduced into the culture tubes. The cultures were transferred five times in nine months; some were kept on for a further six months with four transfers; one set of soil tubes was not transferred. There were four replicates of each combination of organism and cultural treatment and at the end of this period the fungus population was studied by making single-spore or hyphal-tip isolates from each tube on to potato dextrose agar.

T. basicola failed to remain viable in either the transferred or non-transferred soil tubes, being probably unable to withstand dryness as the soil, although moist at inoculation, became dry in two or three weeks. It was noticed that the mutants

appearing in potato dextrose agar and soil infusion agar were lighter in colour than the parent type, had different cultural characters and sporulation, and produced fewer endoconidia. None of the mutants was capable of causing such serious infection as the parent types.

S. glycines was viable for six months in soil cultures. It was very unstable on potato dextrose and soil infusion agars but the original type was still pure after nine months in sterilized soil. The mutants varied considerably from dark cultures similar to the parent types to sterile, albino types.

P. notatum was the most stable of the four, few mutants being obtained from soil infusion agar after 15 months, but it was as unstable as the others on potato dextrose agar.

F. bulbigenum var. *niveum* was found to be similar to *P. notatum* in that transferring encourages mutations on the soil medium. In tubes not transferred there were no mutants even after 15 months.

Transference enables *S. glycines* to survive longer. *P. notatum* and *F. bulbigenum* var. *niveum* still survived after 15 months in soil tubes but two months was the viable limit for *T. basicola* on the same medium. Original strains were soon displaced by mutant types on potato dextrose agar and to a lesser degree on soil infusion agar.

Arêa Leão (A. E.), de Mello (M. T.), & Mayor (V.). **Acarianos infestadores de culturas de cogumelos. Biologia — classificação — métados de combate.** [Acarina infesting fungus cultures. Biology—classification—methods of control.]—*Mem. Inst. Osw. Cruz*, xlii, 3, pp. 559–608, 4 pl., 1946.

A number of fungus cultures infested by mites (probably *Tyroglyphus longior* and *Tarsonemus floricolus*) at the Oswaldo Cruz Institute, Rio de Janeiro, were freed from the mites and re-infestation prevented by the application of kerosene [paraffin] (four to five drops) to the cotton plugs of culture tubes, and in liberal quantities to supports, tables, cupboards, and the like, while Petri dishes should be placed on filter paper soaked in the oil.

Xylene, toluene, benzene, and 'flit' kill the mites immediately but are expensive and inflammable. Paradichlor-benzene is effective in large doses but is inhibitory to fungi besides inducing pleomorphic changes. DDT is ineffective.

A bibliography of 31 titles is appended.

Conklin (D. B.). **Ultra-violet irradiation of spores of certain molds collected from bread.**—*Proc. Iowa Acad. Sci.*, li, pp. 185–189, 1944. [Received March, 1947.]

Experiments were carried out to determine the effect of ultra-violet light from a 15-watt General Electric mercury vapour lamp high in 2537 Å radiation on the bread moulds *Aspergillus flavus*, *A. wentii*, *A. niger*, *A. repens*, *A. ruber*, *Rhizopus nigricans* [*R. stolonifer*], and *Penicillium* sp. [*R.A.M.*, xxi, p. 342; xxv, p. 517]. All the species were inactivated by exposures ranging from $1\frac{1}{2}$ to 6 minutes. The thick-walled, heavily pigmented spores of *A. niger* were the most resistant, succumbing only after the full six minutes' treatment, whereas *A. ruber* failed to grow after $1\frac{1}{2}$ minutes and *R. stolonifer* after two, while the rest were intermediate. Intermittent radiation also inactivated the spores when the total exposure equalled in amount the continuous lethal dose.

Mildew-proofing agent.—*Chem. Engng News*, xxiv, 20, pp. 2826, 2828, 1946.

Hyamine 3258 (Rohm & Haas, Philadelphia), a water-dispersible quaternary ammonium pentachlorophenate containing 40 per cent. active fungicide, is a light tan paste liquefiable by heating to 80° F. The manufacturers claim that it is effective against a variety of destructive moulds, e.g. on cellar walls and leather goods, and extensive practical use was made of it during the war for the

protection of tents and other military equipment from fungal spoilage in the tropics. A typical mildew-proofing formulation consists of 10 per cent. hyamine 3258 with a small amount of isopropanol and a wetting agent, such as triton X-155, all in water solution. In recent tests, samples of vegetable-tanned leather were swabbed with solutions of the fungicide in various combinations, dried, suspended in a moist chamber, and inoculated with a leather-attacking mould. While the untreated controls developed extensive fungal growths within three days, the samples swabbed with hyamine remained free from contamination throughout the three weeks covered by the experiments.

Babička (J.) & Semerád (A.). **Mikroflora der Rohhäute und Leder. Zusammenfassung.** [Microflora of raw hides and leather. Summary.]—*Bull. Acad. int. Prague*, xliii, pp. 274–275, 1 pl., 1 graph, 1943. [Received April, 1947.]

Among the numerous micro-organisms isolated from raw hides and dressed leather in Czechoslovakia the fungi present (in approximate order of prevalence) were *Mucor mucedo*, *Absidia caerulea* (about equally frequent), *Saccharomyces*, *Oidium* [? *Oospora*], *M. plumbeus* (roughly the same incidence), *Aspergillus roseus*, *Dematium nigrum*, *M. caeruleum*, and *A. niger* [*R.A.M.*, xxv, p. 410].

Ettlinger (L.). **Zur kulturellen Gewinnung von Penicillin.** [On the cultural production of penicillin.]—*Ber. schweiz. bot. Ges.*, lvi, pp. 681–695, 3 figs., 3 graphs, 1946.

At the Federal Technical College, Zürich, the writer isolated from a laboratory contamination a strain, ETH 1274, of *Penicillium notatum* forming nearly white colonies and few spores. On a medium consisting of Czapek-Dox solution with the addition of 2 per cent. cane sugar, 0·8 per cent. ammonium tartrate, and traces of zinc and copper, it produced in a week 24 Oxford units of penicillin per c.c. Using a laboratory apparatus of ten rotating aluminium milk cans, each with a capacity of 40 l., a maximum quantity of 13,500,000 Oxford units penicillin was obtained in a working period of three days on a medium of wheat bran, water, and inorganic salts.

Koffler (H.), Knight (S. G.), & Frazier (W. C.). **The effect of certain mineral elements on the production of penicillin in shake flasks.**—*J. Bact.*, liii, 1, pp. 115–123, 1947.

The capacity of maize steep ash for the increase of penicillin production by *Penicillium chrysogenum* X-1612 [*R.A.M.*, xxv, p. 514] in a basal synthetic medium was reproduced by the addition of iron and soluble phosphates. The presence of copper ($>$2 p.p.m.) in the medium completely prevented the accumulation of penicillin, and the addition of only 1 p.p.m. iron offset the effect of copper. Evidence was forthcoming that this interaction between the two minerals affected the synthesis of the antibiotic rather than its destruction.

Whiffen (Alma J.) & Savage (G. M.). **The relation of natural variation in Penicillium notatum to the yield of penicillin in surface culture.**—*J. Bact.*, liii, 2, pp. 231–240, 2 diags., 5 graphs, 1947.

A prolific strain of *Penicillium notatum*, NRRL 1249 B 21 [*R.A.M.*, xxvi, p. 118], when serially subcultured, underwent rapid natural mutation if sporulation was permitted to occur. Mutants sporulating freely and giving low penicillin yields rapidly outgrew the parent type, resulting in a decrease in antibiotic productivity termed 'penicillin run-down'. When sporulation was suppressed, the decline did not occur at any time throughout 50 serial transfer generations.

Continuous selection of clones of maximum productivity from a high-yielding

strain did not result in the isolation of superior strains, the low-yielding mutants derived in this way being much more stable than the parent.

STANLEY (A. R.). **Improving streptomycin yields by strain selection and inoculum development.**—Abs. in *J. Bact.*, liii, 2, p. 254, 1947.

At the Commercial Solvents Corporation, Terre Haute, Indiana, streptomycin yields have been many times increased by strain selection, an original single-colony culture of *Streptomyces griseus* [*R.A.M.*, xxvi, p. 164] giving assays of 100 to 200 μ gm. per ml., for instance, having thus been induced to yield 400 to 500 regularly. After irradiation with ultra-violet light, colony selection resulted in cultures in which yields of 600 to 800 μ gm. per ml. were not uncommon, with a maximum for one strain of over 900 in shake flasks. The process of selection was accomplished by the isolation of large numbers of single-colony cultures of the mould and testing them for streptomycin production on the fermentation medium in use in the plant [see next abstract].

BENNETT (R. E.). **Nutrition of Streptomyces griseus in relation to streptomycin titre.**—Abs. in *J. Bact.*, liii, 2, p. 254, 1947.

In connexion with pilot-plant production of streptomycin [see preceding abstract], the nutritional requirements of *Streptomyces griseus* were studied with the object of securing the optimum medium. With a selected strain of the mould, substrata in current use, such as maize steep water and peptone, beef extract and peptone, and soy-bean, regularly yielded streptomycin titres of 400 μ gm. per ml. in shake flasks and 200 to 400 in 300-gal. pilot-plant runs. Media containing an abundance of proteins, preferably in the form of amino acids or polypeptides, are essential for high titres.

JACKSON (L. W. R.). **Method for differential staining of mycorrhizal roots.**—*Science*, cv, 2724, pp. 291–292, 1947.

The author describes a method for improved differential staining of mycorrhizal roots of shortleaf pine (*Pinus echinata*) [*R.A.M.*, xxii, p. 492; xxiv, pp. 296, 297]. The roots are fixed in acetic-formalin-alcohol solution and embedded in paraffin. The slides are stained in safranin (3 ml. of a 0·5 per cent. aqueous solution in 70 ml. water) for 30 minutes, washed, stained with Cartwright's picro-aniline blue (3 ml. in 70 ml. water) for 5 to 10 minutes, washed, dehydrated, and cleared and mounted in diaphane. Thus the blue-staining hyphae are clearly contrasted with the red-staining elements of the short roots, the dark-coloured hyphae of the pseudomycorrhizal fungi remaining unstained. Differentiation of the intracellular hyphae was obtained by using a Wratten B (No. 58) filter.

The results suggest that the foliar decline diseases of pine [loc. cit.] may be related to a reversal of symbiosis [ibid., xxiv, p. 29] which causes a parasitic phase of mycorrhizal fungi on the short roots under unfavourable conditions.

KAUFFMANN-COSLA (O.) & VASILIU-VÂLCEA (N.). **L'action du magnésium sur la biologie cellulaire. IIième contribution.** [The action of magnesium on cellular biology. Second contribution.]—*Anal. Acad. romăne*, Ser. iii, xvi, Mem. 8, 134 pp., 9 pl., 12 graphs, 1940. [Received April, 1947.]

Experimental evidence showed that when *Aspergillus niger* was grown on Raulin's mixture containing different proportions of magnesium, after 96 hours, sporulation was extremely abundant in the medium containing 0·026 per cent. magnesium, abundant in that with 0·0068 to 0·0017 per cent., sparse in that with 0·00099 per cent., and absent in that with 0·00034 or 0·00024 per cent. It is concluded that reproductive ability or sterility in *A. niger* was conditioned by the amount of magnesium in the medium.

FRIES (N.) & TROLLE (ULLA). **Combination experiments with mutant strains of Ophiostoma multiannulatum.**—*Hereditas*, xxxiii, 3, pp. 377–384, 1947.

In further experiments on mutation in *Ceratostomella multiannulata* [*R.A.M.*, xxv, p. 520], a prototrophic ('wild-type') mycelium developed on malt agar in 14 out of 37 'illegitimate' combinations (between theoretically incompatible mycelial groups) of different physiological variants of the fungus, heterotrophic in respect of uracil, hypoxanthine, adenine, and guanine. A segregation in the perithecial rudiments is presumed to have been responsible for the phenomenon. Heterokaryotic hyphae could not be detected either in these combinations or in those on synthetic nutrient agar, though in 13 out of the 31 last-named some growth was made, probably through the formation of extracellular symbioses.

GÄUMANN (E.) & BÖHNI (ERIKA). **Über adaptive Enzyme bei parasitischen Pilzen. I.** [On adaptive enzymes in parasitic fungi. I.]—*Helv. chim. Acta*, xxx, 1, pp. 24–38, 6 graphs, 1947.

Experiments were carried out to ascertain whether and to what extent the production of pectinase and pectase by *Botrytis cinerea* is affected by the pectin content of a particular nutrient solution. The results showed that pectinase, which splits the pectate chain, is a constitutive enzyme, developing independently of the chemical composition of the medium. On the other hand, the non-specific pectase, which splits the methyl alcohol in pectin, proved to be largely adaptive, being produced in abundance in the presence of pectin but only in traces without it.

NEWTON (W.) & LINES (C.). **The dusting of cut Potato tubers as a preventive against Pythium rot.**—*Sci. Agric.*, xxvii, 2, pp. 72, 73, 1947.

Rotting of potato sets caused by *Pythium ultimum* [*R.A.M.*, xiv, p. 605] causes heavy losses in the coastal regions of British Columbia especially when planted in heavy soils and with subsequent wet weather. Experiments showed that when seed pieces were dusted with various materials and planted in soil inoculated with *P. ultimum* [ibid., xx, p. 489], fermate prevented rotting (21 per cent. infection), with spergon (39) and arasan (40) next, the untreated showing 84 per cent. infection. Hydrated lime, sulphur, dithane, and semesan bel had very little effect, while copper oxide merely aggravated the rot. The results show that the usual dusting of cut tubers, prior to planting, with hydrated lime or sulphur is valueless in preventing the *Pythium* rot.

YOUNKIN (S. G.). **Suscept range of the Potato yellow dwarf virus.**—*Abstr. Thes. Cornell Univ.*, pp. 354–356, 1944. [Received April, 1947.]

This study was concerned with (1) the development of a means of recovery and identification of the potato yellow dwarf virus [*R.A.M.*, xxv, p. 180], (2) determination of the susceptibility of weeds and crop plants to the virus, and (3) determination of the importance of the different suscepts as virus reservoirs under field conditions.

The development of lesions on *Nicotiana rustica*, used as a test plant, occurred most readily at 75° to 80° F. and increased when the leaves were dusted with 600-mesh carborundum before inoculation. A decrease in virus activity resulted during exposure of crude sap extracts from *N. rustica* plants for 15 minutes; more lesions were produced when the inoculated plants were placed in the dark. Of 153 cultivated and uncultivated species of plants tested for susceptibility to the New York and New Jersey strains of the virus the following were reported as susceptible for the first time: buckwheat, rape and other *Brassica* species, radish, clover and vetch species, flax, carrot, *Chrysanthemum leucanthemum* var. *pinnatifidum* and other *C.* species, and salsify.

Symptoms included vein-clearing, vein necrosis, and general necrosis, although some varieties only tended to be stunted. Under field conditions *C. leucanthemum*

var. *pinnatifidum* was found to be commonly infected with the virus, only half of the infected plants showing symptoms. In one case the appearance of infective clover leafhoppers [*Aceratagallia sanguinolenta*] in a clover field was correlated with the appearance of the disease on this plant in the same field. Infected plants of *C. leucanthemum* var. *pinnatifidum* overwinter and provide a source of virus in the following spring. This variety is most abundant in central and western New York State where the yellow dwarf disease of potatoes has been most destructive. Clover plants are relatively unimportant as virus reservoirs.

VAUGHN (J. R.) & LEACH (J. G.). **A comparison of certain Potato sprays in different localities in West Virginia.**—*Amer. Potato J.*, xxiv, 3, pp. 76–82, 1947.

Various materials were combined with DDT in experiments to find an efficient control for late blight of potatoes [*Phytophthora infestans*: *R.A.M.*, xxvi, p. 212] other than Bordeaux mixture. The DDT was used at the rate of $\frac{3}{4}$ lb. per 100 gals. spray and Bordeaux at 8–8–100. In 1945 at Reedsville where late blight was more severe than in 1946, the dithane plus DDT plots yielded nearly 400 bush. per acre, outyielding Bordeaux plus DDT and Bordeaux alone by 39 and 58 bush. per acre, respectively. In 1946 the Bordeaux plus DDT plots slightly outyielded dithane plus DDT plots which had a total yield of about 250 bush. per acre, but the latter exceeded those receiving Bordeaux alone by 56 bush. per acre. At Graham Station in 1945 dithane plus DDT again gave the best results, the plots yielding over 300 bush. per acre, 21 more than Bordeaux plus DDT, but at Huttonsville in 1946, Bordeaux plus DDT, yielding over 200 bush. per acre, slightly outyielded dithane plus DDT, which outyielded Bordeaux alone by 34 bush. per acre. Here, in 1946, dithane plus DDT was applied to 50 acres of a 90-acre commercial potato field and its failure to control the blight was very surprising. One possible reason may have been that an extremely heavy epidemic occurred, coinciding with the unusually rainy period, giving the material too severe a test. According to the manufacturers, dithane needs lower pressures and slower driving speeds than are usually employed. It seems, too, that it needs different conditions from Bordeaux and is useful as a protectant in some areas but would probably give better results generally in the form of dithane HE 178E.

In testing 12 different fungicides in various combinations, fixed copper plus DDT and chromate 518 plus lime gave the best results, with chromates 169E and 169A next, but none of these significantly surpassed Bordeaux plus DDT.

BJÖRLING (K.). **Inventeringar av växtsjukdomar i odlingar av Fabrikspotatis.** [List of plant diseases in plantings of factory Potatoes.]—*Medd. Växtskyddsanst., Stockh.*, 47, 16 pp., 1 map, 1946.

In the south of Sweden the industrial potato crop is largely concentrated in eastern Scania and large areas of Blekinge attached to some 120 small and medium-sized starch factories. Within these limits 364 experimental fields were selected from 285 plantings in 15 manufacturing districts for disease, varietal purity, and yield determinations, and two surveys were made, one covering the last week in July and the first fortnight of August, 1945, and the other extending from 22nd September, 1945, to 10th February, 1946.

Only in 64 plantings were the varieties (17 in all) entirely free from admixtures. The summer inspections disclosed the presence of the three principal virus diseases, leaf roll [*R.A.M.*, vi, p. 370; xxv, pp. 26, 77, *et passim*], streak [virus Y: ibid., xxvi, p. 207], and crinkle either separately or together in about two-thirds of the plantings causing averages of 0·9, 0·9, and 2·2 per cent. infection, respectively. The most virulent outbreaks of crinkle developed in two plantings of Stärkereiche I (26·5 per cent.) and four of Gloria (10), the percentages for the leading varieties, Parnassia and Wohltmann, being 1·6 and 1·7, respectively, and for the three next

in frequency, Voran, Ostbote, and Alpha, 2·8, 2·4, and 2·9 per cent., respectively. Mild mosaic [potato virus X: loc. cit.] was observed in 154 plantings and classified as 'general' in 37, or 10 per cent., of the total included in the survey.

Blackleg (*Bacillus phytophthorus*) [*Erwinia phytophthora*] was evenly distributed over the entire experimental area, involving 84 per cent. of the plantings, with an average incidence of 1·2 (maximum 9) per cent. The intensity of late blight (*Phytophthora infestans*) reached a maximum of 2 to 3 (average 1·7 in a scale 0 to 5) in about half the plantings in Scania. *Rhizoctonia* [*Corticium*] *solani* occurred sporadically in some 40 per cent. of the plantings uniformly distributed over the whole area.

Manganese deficiency [ibid., xxiv, p. 385] was present in an acute form in 61 plantings (17 per cent.), mostly situated in a tract beginning in the plains south of Kristianstad and including north-east Scania, the Tvärskog district, Listerland, and part of western Blekinge. Scab (*Actinomyces* spp. [including *A. scabies*: ibid., xxv, pp. 77]) occurred on 40 per cent. of the plantings in the manganese-deficiency tract compared with 25 per cent. in the rest of the area under observation, a similar correlation being noted in respect of black scurf (*C. solani*).

Josefsson's theory of an association between internal rust spot and manganese deficiency [ibid., xxiv, p. 385] was not corroborated by the results of the present investigation. Of the samples from 52 plantings with manganese-deficiency symptoms, only four showed internal rust spot, which was present, on the other hand, in 13 from 281 plantings unaffected by the deficiency.

Of the diseases enumerated, the viruses, late blight and tuber-rot, and magnesium deficiency may be regarded as limiting factors in starch-production. Exact figures for the crop reductions caused by the several disorders are not available, but a conservative estimate rates them at over rather than under 10 per cent.

ANDERSON (A. L.), HENRY (B. W.), & TULLIS (E. C.). **Factors affecting infectivity, spread, and persistence of Piricularia oryzae Cav.**—*Phytopathology*, xxxvii, 2, pp. 94–110, 1 fig., 1947.

A tabulated account is given of greenhouse and field inoculation experiments (the latter at Beaumont, Texas) on rice plants in 1944 and 1945 with *Piricularia oryzae*, applied either in the form of a conidial suspension in sodium oleate-gelatine (0·05: 0·25 per cent.) solution [*R.A.M.*, xxvi, p. 167] at the rate of 1,000,000 conidia per sq. ft. or as filter-cake dust from an admixture of finely ground, black, neutral peat with a fungal suspension (2,500,000 conidia per sq. ft.). In the greenhouse tests on the Acadia and Onsen varieties, a humidity tent was used to provide favourable conditions for the establishment of infection of the plants. It consisted of a muslin cover wetted by an external overhead sprinkling system and supported by a steel frame over a deep, water-tight bench. A water humidifier maintained a high humidity within the tent and the temperatures were adjusted to a range of 22° to 28° C.

The plants were most susceptible to blast in the seedling, early tillering, and heading stages [ibid., xvii, p. 767]. Under the conditions described, the maximum degree of infection was obtained from 16 to 24 hours' exposure of the plants to continuous wetness, while none resulted from less than ten hours. Inoculated plants exposed to eight hours' wetting, followed by a dry and a second wet period, contracted from 30 to 50 per cent. of the maximum incidence of infection. Under very humid conditions, permitting the presence of free moisture on the leaves, a 21½- (but not a 15-) hour exposure resulted in secondary spread and the establishment of a high degree of infection. A minimum period of six days after inoculation was requisite for the development of the lesions to a stage capable of producing conidia to serve as inoculum for the secondary spread of the disease. The conidia retained their viability on dry plants for six days in the greenhouse. In suspension

there was a rapid decrease of viability during the first 24 hours at 28° to 32°: these being below the normal temperatures of irrigation water in Texas rice fields, the survival of the conidia in this medium for a longer period is considered improbable and the risk of conidial dissemination through such a channel remote [cf. ibid., viii, p. 461.]

No antagonism was observed between the conidia of *P. oryzae* and those of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] growing in conjunction on rice-polish agar or germinating together in water. When the two pathogens were combined for use in plant inoculation, *O. miyabeanus* reduced the amount of infection caused by *P. oryzae*.

Of 17 Japanese short- and two American medium-grain varieties tested in the three- to five-leaf stage for their reactions to *P. oryzae*, 11 were placed in the very susceptible or susceptible categories, one (Butter) was classed as resistant, and the remainder were intermediate in response to inoculation. Barley, maize, rye, and wheat seedlings also proved susceptible to infection by the blast fungus.

Melchers (W. J.) & Gerritsen (H. J.). **Koper als onmisbaar element voor plant en dier.** [Copper as an indispensable element for plants and livestock.]—56 pp., 24 figs. (5 col.), 1 diag., Wageningen, N.V. Drukkerij 'Vada', 1944. Fl. 1.90. [German, French, and English summaries. Received April, 1947.]

This is a valuable survey of the information accumulated, chiefly in Holland, on the disorders of agricultural crops and livestock associated with copper deficiency (reclamation disease) in the soil. Many references to the phytopathological aspects of the subject have appeared from time to time in this *Review*.

Bradfield (J. R. G.). **Plant carbonic anhydrase.**—*Nature, Lond.*, clix, 4040, pp. 467–468, 2 graphs, 1947.

During a study of the distribution of carbonic anhydrase in plants the author noted that among those known to contain the enzyme are several, e.g., grapefruit, peach, tomato, which are subject to diseases such as mottle leaf and little leaf, attributed to zinc deficiency. Animal carbonic anhydrase contains zinc and if the plant enzyme also contains this element the author suggests that it would be interesting to examine the anhydrase content of zinc-deficient plants.

Ling (L.). **Host index of the parasitic fungi of Szechuan.**—*Nanking J.*, xi, 3, pp. 117–142, 1942. [Received December, 1946.]

This index [cf. *R.A.M.*, xxii, p. 327], a contribution from the Division of Plant Pathology and Economic Entomology, Szechuan Provincial Agricultural Improvement Institute, Chengtu, China, is based mainly on observations and collections made during numerous tours of inspection between 1937 and 1941. The host genera are arranged in alphabetical order of their scientific names, and the fungi are listed, also alphabetically, under their respective hosts.

Săvulescu (T.). & Săvulescu (Olga). **Matériaux pour la flore des Urédinées de Roumanie.** [Materials for the flora of the Uredineae of Rumania.]—*Mem. Sect. sci. Acad. roum.*, Ser. 3, xvii, pp. 113–149, 18 figs., 1942. [Received February, 1947.]

This is a critically annotated list of 345 rusts collected in Rumania [cf. *R.A.M.*, xix, pp. 365, 729] on 629 hosts belonging to 47 families.

Jenkins (Anna E.) & Bitancourt (A. A.). **Observações sôbre espécies do gênero 'Elsinoë' de Uganda.** [Observations on species of the genus *Elsinoe* of Uganda.]—*Arq. Inst. biol., S. Paulo*, xvii, 3, pp. 47–54, 2 pl., 1946. [English summary.]

Latin and Portuguese diagnoses are given of six species of *Elsinoe* collected in Uganda by C. H. Hansford (*Mycol. Pap., Imp. mycol. Inst.*, 15, 1946), including *E. sidae*, the agent of a foliar scab of *Sida cordifolia*.

Ubrizsy (G.). **Adatok a Nyirség lisztharmatgombainak (Erysiphaceae) ismeretéhez.** [Contributions to the knowledge of the Erysiphaceae of Nyirség.]—*Acta mycol. hung.*, iii, 1–4, pp. 28–33, 1946.

The incidence of powdery mildews in the Nyirség region of the great plain of Hungary is favoured by heavy dews, injury to the aerial parts of plants by wind-blown sand, close cropping, and abundant summer sunshine. Incidence of infection was notably less in the shade. Among the 24 species listed [cf. *R.A.M.*, xxvi, p. 80], *Uncinula necator* on vine, *Sphaerotheca pannosa* var. *rosae* on roses, *S. p.* var. *persicae* on peach, *Podosphaera leucotricha* on apple, and *Microsphaera abbreviata* on young oak seedlings cause considerable losses locally. Others of interest are *Erysiphe artemisiae* on *Artemisia vulgaris*, *E. cichoracearum* on dandelion (*Taraxacum officinale*), cucumber, melon, watermelon, and marrow, *E. communis* on horse-radish and charlock, *E. horridula* on *Echium vulgare*, *E. pisi* [*E. polygoni*] on pea, *E. urticae* on nettle, *E. martii* on *Lotus corniculatus*, *Melilotus albus*, and *Robinia pseud-acacia*, and *E. graminis* on wheat, *Microsphaera berberidis* on *Berberis* spp., *M. lonicerae* on *Lonicera* sp., *Phyllactinia suffulta* on snowberry (*Symphoricarpos racemosus*) [*S. albus*] and lilac [ibid., xxv, p. 329], *S. humuli* on hops, *S. mors-uvae* on gooseberry, *Trichocladia* [*Erysiphe*] *tortilis* on *Cornus sanguinea*, *U. prunastri* on plum and *Prunus spinata* var. *dasyphylla*, *U. salicis* on poplar (*Populus italica*), *Podosphaera* [*oxycantha* var.] *tridactyla* on plum, and *Oidium euonymi-japonicae* on *Euonymus japonica* [ibid., xix, p. 297].

Jenkins (Anna E.) & Bitancourt (A. A.). **Duas verrugoses do Chá, causadas por 'Elsinoe', e sua distribuição.** [Two Tea scabs caused by *Elsinoe* and their distribution.]—*Arq. Inst. biol., S. Paulo*, xvii, 5, pp. 67–72, 1 pl., 1946. [English summary.]

From a study of specimens and published records it is concluded that mottle scab of tea (*Elsinoe theae*) occurs in Ceylon [*R.A.M.*, xx, p. 599]; Kangra Valley, Punjab, India, where it was described by Chaudhuri *et al.* [ibid., xvii, p. 71] as 'scabbing of leaves'; Uganda (included by Hansford in his list of parasitic fungi [ibid., xxiii, p. 79]); Tanganyika Territory [ibid., xx, p. 573]; Nyasaland ('leaf scab') [ibid., vii, p. 275]; and São Paulo, Brazil [ibid., xix, p. 369.]

The white scab attributed by Kurosawa in Japan to *Sphaceloma theae* (*Ann. phytopath. Soc. Japan*, ix, pp. 131–132, 1939) appears to be distinct from mottle scab, and specimens received from Guatemala have been identified as the former. The fungus present on this material in the perfect and conidial states is described as a new species, *E. leucospila* Bitanc. & Jenk. (*S. theae* Kurosawa). It forms on the leaves scattered, sometimes confluent, circular or somewhat irregular, raised, smooth or slightly rugose, occasionally fissile spots, up to 4 mm. in diameter, with white or dirty white centres and a Natal-brown margin; superimposed on the periphery of the centres are the gonidia of the alga *Cephaleuros virescens* [*C. mycoidea*], which impart a glass-green to Chartreuse-yellow tint to the tissues. The erumpent, pulvinate, hyaline, pseudoparenchymatous ascomata, 50 to 100 μ in diameter and 50 to 80 μ in height, are occupied by globose asci, 20 to 50 μ in diameter, containing eight hyaline, bi- to triseptate ascospores, the median cells sometimes furnished with longitudinal septa, 13 to 16 by 5 to 7 μ. The imperfect state is represented by acervuli or sporodochia composed of a palisade of coalescent, fuscous, usually uniseptate conidiophores, 15 by 3 μ, arising from a fuscous pseudoparenchyma; conidia were not observed.

Subba Rao (M. K.). **Blister blight of Tea in South India.**—*Pap. Unit. Plant Ass. Sth. India* (*Tea sci. Sect.*) 4, ii+14+iii pp., 6 figs., 1 diag., 1 map, 1946.

In connexion with the first outbreak of blister blight (*Exobasidium vexans*) on tea in South India in August, 1946, the available information on the etiology,

symptomatology, effects, origin, and control of the disease in the north-east of the country is summarized from the relevant literature [*R.A.M.*, iv, pp. 4, 432; vii, p. 542]. Exceptionally wet conditions prevailed during the period of the epidemic, which persisted until late in November and caused heavy losses, estimated on two medium-sized estates to have ranged from 5,000 lb. made tea in August to 20,000 lb. in September.

The following are some recommendations for the control of the disease, based on experience in Assam adapted to local conditions. Pruning during the period from February to May should be avoided in view of the high susceptibility to infection of the resultant new growth. Contaminated prunings should be buried or burned. Rim-lung pruning should not be practised, the young foliage of the 'lungs' or 'breathers' being a potential source of infection. Excessively dense shade should be reduced by thinning-out. Spraying with Bordeaux or Burgundy mixture or perenox should be done in May, two applications being given on estates, with a fortnight's interval, while in nurseries monthly spraying in the dry weather and fortnightly in the wet season is advised. Picking and destruction of diseased leaves and shoots should be continued throughout the year, since the plucking surface of mature tea may be infected at any time, particularly under dense shade or under humid conditions. Recurrent outbreaks in isolated areas should be combated by spraying the affected bushes (after removal of all diseased material) and about four or five rows of the surrounding tea at 10- to 14-day intervals. The provision of spraying equipment adapted to large-scale operations is essential to blister-blight control. All tea seed should be treated with a fungicidal dust, such as agrosan G.N. supplied by Imperial Chemical Industries (India) Ltd., or harvesan (Boots Pure Drug & Chemical Ltd.). The co-operation of neighbouring estates should be sought in the control of the disease at all stages, since the fungus spreads rapidly and causes serious damage within a very short time.

Wyckoff (R. W. G.). **Electron micrographs from concentrated solutions of the Tobacco mosaic virus protein.**—*Biochim. biophys. Acta*, i, 2, pp. 139–146, 5 figs., 1947. [French and German summaries.]

Shadowed metal replicas and freeze-drying can be used to make preparations of which the electron micrographs show the molecular particle arrangement in concentrated solutions of the tobacco-mosaic virus protein and in films dried from such solutions [*R.A.M.*, xxvi, p. 268]. The preliminary figures of the preparations in question here reproduced present continuous bidimensional sheets and other regularities in particle alignment.

Smith (K. M.). **The transmission of a plant virus complex by aphides.**—*Parasitology*, xxxvii, 3, 4, pp. 131–134, 1946.

This a full account of work previously published in an abbreviated form [*R.A.M.*, xxiv, p. 208] on the tobacco rosette virus-disease complex. In the transmission experiments it was found that the aphid *Myzus convolvuli* is also a vector of the tobacco rosette disease. Experiments with *Datura stramonium* showed that this plant is susceptible to the mottle virus but is resistant to the vein-distorting virus of the complex; thus, the aphid can pick up both viruses from an infected plant for a little while but as soon as the vein-distorting virus has lost its infectiveness it cannot pick up the mottle virus from the same plant.

Ramakrishnan (T. S.) & Soumini (C. K.). **Fruit rot of Tomatoes caused by Phytophthora palmivora Butl.**—*Proc. Indian Acad. Sci.*, Sect. B, xxv, 2, pp. 39–42, 1 pl., 4 figs., 1947.

A rot of tomato fruits was observed in the Coimbatore district during the rainy seasons of 1944 and 1945. Infection originated on the fruits of the lower branches

in contact with the soil, nearly 25 per cent. of which were attacked, and subsequently spread to those of the upper ones. A few stems and branches in proximity to the ground also turned dark brown and decayed. On green fruits the small, water-soaked spots produced at the blossom end or the part touching the soil rapidly enlarge and in three or four days cover the whole surface. The diseased tomatoes acquire a brownish tinge, feel soft to the touch, and the skin readily peels off. A white, flocculent, superficial, growth develops in wet weather. A concentric pattern may be formed in the affected areas.

The causal organism was isolated in pure culture from a single sporangium. It grew well on oat and French bean agars, producing numerous oval or piriform, papillate, mostly terminal sporangia, 18·6 to 46·5 by 15·5 to 37·2 (mean 33·4 by 22·6) μ, and spherical, hyaline or pale yellowish-brown, intercalary or less frequently terminal chlamydospores, 15·5 to 31 (23·4 by 20·5) μ. Oospores did not develop. The fungus was grown in paired culture with two strains of *Phytophthora* from areca palm [*R.A.M.*, xxi, p. 165]; one of the dual cultures formed spherical, yellowish oospores, 15·5 to 24·8 (20) μ in diameter. The tomato strain closely resembles one isolated by Uppal and Desai from areca palm (Nilekani strain) in 1939 [ibid., xviii, p. 518] and is also similar to Butler's South Kanara areca strain of *P. palmivora* [cf. ibid., xvii, p. 589]. A more detailed study of all the South Indian isolates of *Phytophthora* and others procured from different sources is in progress.

Positive results were given by inoculation experiments on growing and detached fruits, which rotted completely in five to six days, the same fungus being recovered from the diseased tissues. Entry was shown to take place through the unwounded surface of any part of the fruit. Young branches and leaves also reacted to inoculation by the development of a blackish-green, wet rot, the decayed portions falling off or the stem breaking at the site of infection, the further spread of which is arrested by the severance of the diseased material.

It is recommended that tomato plants should be staked or tied to frames to prevent contact with the soil and sprayed with Bordeaux mixture.

ABERDEEN (J. E. C.). **Experiments in the control of bacterial wilt of Tomatoes in south-eastern Queensland.**—*Qd agric. J.*, iii, 2, pp. 87–91, 1946.

During experiments from 1938 to 1940 on the control of bacterial wilt of tomato, *Xanthomonas solanacearum* [*R.A.M.*, xxiv, p. 478; xxv, p. 102], soil treatments described by Eddins [ibid., xviii, p. 473] were used. Sulphur applied in autumn to produce a pH value of 4 and lime added in mid-summer to restore the value to 5 failed to control the wilt. In varietal trials for resistance Break o'Day proved very susceptible but strains of the Australian variety Sensation and Marvel from the United States showed signs of resistance, although the first-named is not good commercially. Louisiana Pink No. 1 and Carolina Cross No. 2, both selected for resistance in North Carolina, gave good results but must be improved.

YOUNG (P. A.). **Cuticle cracks in Tomato fruits.**—*Phytopathology*, xxxvii, 2, pp. 143–144, 1 fig., 1 diag., 1947.

During the week of 25th June to 1st July, 1945, Texas farmers lost the No. 1 grade price on many car-loads of green-wrap tomatoes from cracking of the cuticle of the tops within 2 cm. of the pedicels. The abnormality was closely correlated with a total rainfall of 1·38 in. on 22nd and 23rd June, followed by a temperature of 90° to 92° F. during the next three days. For the first day or two the cracks remained hyaline, but with the desiccation of the epidermal cells they turned black or brown, and within five days sunken, black spots, 3 to 12 mm. in diameter, had developed over the affected areas. Similar but fewer cracks were formed in green and red fruits between 11th and 21st November of the same year at a temperature

range of 45° to 80°; during this period there was only 0·1 in. rain on five days, but the soil contained sufficient water from the 1·96 in. on the 9th and 10th. Microscopic examination of water mounts of the epidermis from affected fruits showed the cuticle cracks (most of which were short arcs of circles disposed concentrically round the pedicel) to range from 25 to 3,000 μ by 12 to 45 μ, lying 100 to 300 μ apart, while the perpendicular fissures in some of the cracks measured 24 by 2 μ and were situated 3 to 6 μ apart in the longest one observed.

In 1946 the disorder assumed a milder form as compared with 1945, probably owing to the cooler conditions.

The cuticle crack herein described was more severe in varieties with dark-green stem ends (conferred by UU genes) in immature fruits, those of a uniform whitish-green colour at the corresponding stage (uu genes) being less susceptible: three selections of the latter type, including Crack-Proof, were also resistant to stem-cracking. Both forms frequently occur in the same fruits and probably originate in the uneven growth resulting from an unbalanced water supply. The subcuticular stem or growth cracks were 1 to 6 cm. long and 1 to 5 mm. deep and sometimes crossed the blossom end of the fruits, especially in the Trip-L-Crop variety; in Rutgers and Marglobe they were usually radial and in Louisiana Red concentric.

KUHNHOLTZ-LORDAT (M.). **Considérations générales sur le dépérissement des Châtaigneraies cévenoles et suggestions d'ordre pratique qui peuvent en découler.** [General considerations on the decline of the Chestnut groves in the Cevennes and practical suggestions that can result from them.]—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 25–53, 9 fig., 1944. [Received February, 1947.]

In this paper (based on a lecture delivered to chestnut-growers in Gard, France, on 6th August, 1942) the author states that he has attempted to recapitulate all that is known about the chestnut wilt disease, associated in the Cevennes with *Phytophthora cambivora*, *Armillaria mellea*, and, possibly, insect attack [*R.A.M.*, xxiv, p. 436], and its control. The primary symptoms are chlorosis, non-setting of the fruit, and 'fioc' or 'fire', which is a form of leaf-withering. The secondary symptoms consist of death of the top of the tree followed by ink disease, with black 'sweating' at the base of the trunk. Similar symptoms due to other causes are also described. Prophylaxis in relation to cultural practices and varietal resistance is discussed, and suggestions are made for an immediate campaign against the disease. The lines on which further study should proceed are indicated.

POPE (S. A.). **Some studies on the Dutch Elm disease and the causal organism.**—*Abstr. Thes. Cornell Univ.*, pp. 347–348, 1944. [Received April, 1947.]

Although the majority of authors in this field seem to think that wilting is primarily due to toxic materials produced by the infecting organism, this does not appear to apply to the Dutch elm disease [*Ceratostomella ulmi*; *R.A.M.*, xxv, p. 86; xxvi, p. 45], since toxic materials taken from various extracts and introduced into trees growing in pots did not cause wilting, although xylem tissue discoloration was noticed. The extracts themselves, however, did produce wilting in healthy elm cuttings as did various yeast fractions and extract in which the fungus had grown. Two of four fractions from each solution had toxic properties and since these were not derived by the same chemical treatment *C. ulmi* is believed to be able to produce more than one substance toxic to elm cuttings.

The action of toxic materials produced by the growth of the fungus seems to centre round the fungus itself, no discoloration appearing in advance of the pathogen, but although tissue discoloration may appear subsequently there is no outward visible symptom. The parenchymatous cells survived when over four

cells distant from the fungus mycelium, injury being caused by the formation of tyloses and gum in the vessels bordering these cells soon after the appearance of the fungus in the area. The toxic materials are produced too slowly by the fungus to cause any visible injury far ahead of it.

The daily water loss from healthy and inoculated *Ulmus americana* and *U. pumila* indicated that wilting was due to interference in the flow of water to the leaves; the stomata showed no signs of injury, wilting leaves recovering when removed from the diseased tree. The increased resistance of the American elm when inoculated after the formation of the summer wood is due to the arrangement of the vessels, the fungus being unable to spread through a sufficiently large area of xylem to cause serious wilt by extensive plugging of the vessels.

Mineral tests [ibid., xiii, p. 733] showed that potassium, phosphorus, and sulphur were necessary for the growth of *C. ulmi*. Pyridoxine (B_6) was the only vitamin shown to be essential. The growth of the fungus is improved by a combination of amino acids with salts, sugar, and pyridoxine. The addition of rice bran extract and of glutathione to this medium brought the growth of the fungus to nearly normal. Potato dextrose agar was the best medium for cultures.

Rhoads (A. S.) & Wright (E.). **Fomes annosus commonly a wound pathogen rather than a root parasite of Western Hemlock in western Oregon and Washington.**—*J. For.*, xliv, 12, pp. 1091–1092, 1946.

In a recent study of 600 scars (mostly inflicted from 5 to 32 years ago), 36 sunscald lesions, and 37 broken tips on 198 western hemlocks (*Tsuga heterophylla*) in western Oregon and Washington, *Fomes annosus* [*R.A.M.*, xxii, p. 231] was found in connexion with 119 of the 296 scars showing decay, in five sunscald lesions, and in three broken tops, the corresponding numbers of isolations from these sources being 95, 4, and 3, respectively. The volume of decay due to the pathogen exceeded that of all other fungi combined, amounting to 6·9 per cent. of a total gross volume of 28,848 cu. ft. and 6·5 per cent. of a total commercial volume of 26,978 cu. ft. *F. annosus* accounted for 55·3 per cent. of a total gross decay volume of 3,580 cu. ft. and 54·9 per cent. of a total commercial decay volume of 3,189 cu. ft. The same organism was isolated only once from 104 scars, one sunscald lesion, and four broken tops in 36 Sitka spruce (*Picea sitchensis*) trees dissected.

Pettifor (C. B.) & Findlay (W. P. K.). **Effect of sap-stain on the tensile strength of Corsican Pine sapwood.**—*Forestry*, xx, pp. 57–61, 1 fig., 1947.

In further studies of the effect of sap-stain on timber [cf. *R.A.M.*, xix, p. 180] the results were identical with those previously obtained. In these tests pieces of Corsican pine (*Pinus nigra* var. *calabrica*) sapwood 12 by $\frac{1}{4}$ by 1 in. inoculated with *Ceratostomella caerulea*, *C. pilifera*, or *Diplodia natalensis* were used. After 64 days' incubation the losses in tensile strength from *C. caerulea* and *C. pilifera* were 5·8 and 5·6 per cent., respectively, but were not significant, and from *D. natalensis* [cf. ibid., xix, p. 379] 17·1 per cent. After 94 days' exposure the losses were 11·4, 11·5, and 14·1 per cent. respectively, with a loss of 12 per cent. in unsterilized pieces from general infection after 96 days.

As in the previous tests, blue stain had no appreciable effect on the compressive or the bending strength but caused a marked reduction in toughness which involves the tensile strength.

Björkman (E.). **Om uppkomsten av stockblånad och lagringsröta i Furusågtimmer i samband med flottning.** [On the development of log blue stain and storage rot in Pine sawing timber in connexion with floating.]—*Medd. SkogsforskInst., Stockh.*, xxxv, 5, pp. 1–56, 6 figs., 17 graphs, 1947. [English summary.]

The following are some of the most important results of experiments carried out

in north Sweden in 1944–5 to determine the extent of fungal damage in pine sawing timber stored for varying periods in flowing and still water and on land after complete, 'spot' (partial), or no decortication [cf. *R.A.M.*, xxvi, p. 88]. The unbarked logs, in comparison with the wholly decorticated, sustained relatively little injury from cracks, blue stain (commonly associated with *Cladosporium herbarum*, *Pullularia pullulans*, and *Phialophora fastigiata*: [ibid., xxv, p. 373, and next abstract]), and storage rot (predominantly, and in most cases exclusively, due to *Stereum sanguinolentum*). The peeled timber stored on land until 1st July suffered considerably more damage than that kept at the landing only until 1st June and then floated, while the maximum of blue stain and storage rot occurred in logs left in still water, the incidence of infection increasing progressively with the prolongation of the storage period. Decay fell to a minimum in the timber stored in flowing water and continuously washed over by a strong current. Fungal damage to logs sawn on 1st July was inconsiderable and consisted almost entirely of blue stain, which had become more prevalent by 1st August; storage decay did not appear before 1st September.

Since wholly decorticated timber invariably develops blue stain and later storage rot during the floating process, logs stripped of their bark to promote buoyancy should arrive not later than 1st August at the sawmill, where they should either be sawn immediately or protected from fungal invasion by means of a water spray or submersion in large piles. 'Spot'-barking for the enhancement of buoyancy may be practised with advantage in normal floating procedure (immersion not later than 1st June and kept in water until 1st November). Land storage for periods up to one month during the floating season results in only slight damage. The bark should not be removed from wood that floats sufficiently well without recourse to this practice, or where the logs can be immersed before June.

BJÖRKMAN (E.). **Om betingelserna för uppkomsten av brädgårdsblånad samt dennas bekämpande.** [On the conditions for the development of timber-yard blue stain and on its control.]—*Medd. SkogsforskInst., Stockh.*, xxv, 7, pp. 1–46, 7 figs., 1 diag., 4 graphs, 1947. [English summary.]

Besides *Pullularia pullulans*, *Cladosporium herbarum*, and *Phialophora fastigiata*, the most widespread agents of blue stain in Swedish timber yards [see preceding abstract], many other species were encountered in the writer's investigations, including *Ophiostoma* [*Ceratostomella*] *piceae*, *O.* [*C.*] *pini* [*R.A.M.*, xxiv, p. 392], *Trichosporium heteromorphum* [ibid., xxi, p. 58], at least three species of *Penicillium*, and *Trichoderma lignorum* [*T. viride*: ibid., xxii, p. 121], of which the last-named predominated as an agent of 'mould blue stain'. *Stereum sanguinolentum* [see preceding abstract] and *Peniophora gigantea* [ibid., xix, p. 685] were occasionally found causing storage rot of boards stacked for protracted periods and exposed to saturation by rain or snow.

The results of spore-trapping experiments in June, July, and August, 1943, involving the ten-minute exposure in different parts of the yards of Petri dishes containing malt agar, showed the blue-staining fungi to be practically ubiquitous, whereas in a comparable test on 14th May, 1946, their incidence was negligible. Hence the risk of atmospheric contamination during the period of prevalence of the organisms can only be eliminated by the provision of conditions adverse to their development. In experiments to determine the lower humidity limit for the growth of blue-staining fungi in wood [ibid., ix, pp. 77; x, p. 146; xviii, p. 360], no appreciable discoloration occurred where the final moisture content was below approximately 24 per cent. of the dry weight, while at 90 per cent. relative air humidity the incidence was considerably less (0,0,0,30, and 80 per cent. of the block surfaces on 24th June, 29th July, 26th August, 23rd September, and 21st October, respectively) than in a saturated atmosphere (5,5,40,60, and 100 per cent.,

respectively). Furthermore, wood absorbs moisture but slowly from the atmosphere, so that shipping-dry timber with a moisture content of 18 to 22 per cent., unless directly exposed to water, runs little risk of blue-stain infection even in saturated air. On the other hand, the discoloration developed at 90 per cent. relative air humidity in newly sawn, undried wood. The percentage incidence of *C. piceae* in the undried blocks at 90 and 100 per cent. relative air humidity was 20 and 100 for pine, and 5 and 100 for spruce, the corresponding figures for *Phialophora fastigiata* being 5 and 0, and 30 and 5, respectively. Neither fungus developed in the dry blocks. These data incidentally confirm the well-known superiority of spruce to pine timber in respect of resistance to blue stain. For this reason it is a common practice to saw pine in the spring and early summer when, as indicated above, there is little risk of blue stain, and to reserve the spruce for the late summer and autumn, when the prevailing temperatures coincide with the optimum (20° to 25° C.) for the development of the causal organisms.

Rational methods of piling the timber so as to allow free circulation of air through the stacks are described [ibid., xxvi, p. 88]. In oven-drying experiments, both 'full' (56 hours) and 'half' (28) drying afforded adequate protection against blue stain, but full drying is advisable during the period of maximum liability to the defect (July to September). In impregnation tests on pine boards the chlorophenol preparations, dowicide and pentolat (the latter supplied by Uddeholms AB), there was a marked disparity between the 1944 and 1945 results. Whereas in the former year even the maximum concentration of 0·8 per cent. failed to prevent the development of blue stain from June to September, in the latter (an exceptionally dry season) no infection occurred in the boards treated with a 0·6 per cent. solution. There was little difference in efficiency between the two fungicides. In practice, a 0·8 per cent. solution should be safe in June and July, while the use of a higher strength (1 to 2 per cent.) is recommended for the critical period from August to October. All the impregnated boards in unroofed piles were found to have developed blue stain under the influence of moisture, demonstrating the need for protection even of treated material.

Wilson (J. D.). **Use of fixed coppers on vegetables.**—*Agric. Chemicals*, i, 8, pp. 32–34, 1946.

After referring to the injurious effects sometimes produced on plants by Bordeaux mixture [cf. *R.A.M.*, xxiv, pp. 221, 406; xxv, p. 268], the author states that the fixed coppers [ibid., xix, p. 507], designed to replace it on Bordeaux-sensitive hosts, fall into four groups: the oxychlorides, the basic sulphates, the oxides, and a miscellaneous group which includes a combination of an oxychloride and a sulphate (COCS) [ibid., xxiv, p. 396], as well as various other copper salts. The best known oxychlorides are copper A [ibid., xxiv, pp. 262, 396] and cupro K [ibid., xvi, p. 544]. Among the basic sulphates are such trade names as tribasic [ibid., xxiv, p. 209], basicop [ibid., xxiv, pp. 396, 477], and spraycop [ibid., xxii, pp. 221, 481]. Cuprocide [ibid., xv, p. 552; xxiv, p. 396, *et passim*] is the most widely used oxide. Other names include coposil [ibid., xiv, p. 591], copper hydro 40, copper zeolite [ibid., xv, p. 665], basic copper arsenate, brown cupric hydrate, and bordow [ibid., xxiii, pp. 70, 444].

In general, the fixed coppers are less effective in the control of disease than Bordeaux mixture, but even so the yields are not usually less. As a group they are less adhesive. In most cases, an equivalent amount of copper should be applied in the form of a fixed copper as is used in Bordeaux mixture, and applications should be made at the same intervals. In dust form, the fixed coppers should be used at the rate of at least 45 to 50 lb. per acre of a 7 per cent. dust.

Specific recommendations for the use of the fixed coppers against various vegetable diseases are listed. Basic sulphates give the best results for carrots and

Cucurbita spp. with tomatoes next. The oxychlorides, COCS, and cuprocide are effective for most vegetables, the first, however, may cause some injury to potatoes and carrots, and the last-named to potatoes and *Cucurbita* spp.

Kovačevski (I. C.). Опити затретиране на зеленчукови семена с органически живачни препарати и меденкарбонат. [Experiments in vegetable seed treatment with organic mercurials and copper carbonate.]—*Bull. Chambre Cult. nat., Sofia*, Sér. Biol., &c., i, 1, pp. 87–129, 1946. [English summary.]

The writer describes and tabulates the results of experiments in vegetable seed disinfection in Bulgaria with some standard organic mercurial steeps and dusts and copper carbonate dust (20 per cent. copper content). Ceresan (U. 564) was the least injurious of the liquid preparations, one hour's immersion in a 0·25 per cent. concentration or half-an-hour at 0·5 per cent. being readily tolerated by most of the 14 kinds of seed used in the tests. It was followed by germisan (G. 3659 I-nass), which was also innocuous to most species under the same conditions. The third and fourth places were occupied by fusariol-neu (2115-a) and abavit-nass (3330-a), respectively.

Copper carbonate could be applied with complete safety, even in excess, both to dry and moist seed. Abavit-neu was also harmless, except to the May King lettuce variety. Germisan (G. 4096a-trocken) and U.T. ceresan (1875a) caused relatively little injury, but the use of fusariol and granosan dusts can only be recommended, on the basis of these tests, for very refractory infections against which milder treatments are unavailing.

Of the various species of vegetables tested, okra [*Hibiscus esculentus*] was the most tolerant of seed disinfection, followed by onion, while lettuce was more sensitive than any of the others. The maximum stand increases in response to seed treatment were secured with cucumbers, peas, and beans [*Phaseolus vulgaris*], while tomato, chilli, eggplant, *H. esculentus*, cabbage, spinach, and carrot also benefited significantly.

Lhoste (L.). **Le pied noir de la Betterave.** [Black leg of Beet.]—*Rev. hort., Paris*, N.S., xxx, 14, p. 232, 1947.

Black leg of beet caused by *Phoma betae* [*R.A.M.*, xxv, pp. 26, 56], carried on the seed in pycnidia, is largely checked by seed disinfection, by steeping or, better still, dusting. Products such as ceresan (at 800 gm. per 100 kg. seed) are recommended by the Belgian Institute at Tirlemont, and germex was found to be equally effective at the Gembloux Station. Treated seed should not be kept in stock for over a year.

Vanderwalle (R.). **Observations et recherches effectuées a la Station de Phytopathologie de l'État pendant l'année 1942.** [Observations and researches carried out at the State Phytopathological Station during the year 1942.]—*Bull. Inst. agron. Gembloux*, xii, 1–4, pp. 97–109, 1943. [Received March, 1947.]

In this report, on the same lines as those for previous years [cf. *R.A.M.*, xxv, p. 152], it is stated that haricot beans [*Phaseolus vulgaris*] at Gembloux, Belgium, frequently showed the presence of K. M. Smith's *Phaseolus* viruses 1 and 2 [bean mosaic virus and bean yellow mosaic virus, respectively], concurrently on the same variety, while bean virus complexes were also prevalent. From a list compiled by the Agricultural Adviser for the province of Hainaut, showing the resistance of haricot bean varieties to virus diseases [unspecified], it appears that Beurré jaune, Beurrée doré nain, Saint-Esprit, and the high-yielding Métis and Supermétis are resistant. The Princesse à grain blanc variety shows marked symptoms of virus

attack: the leaves lose colour, the leaf blades are malformed and undulating, the sepals curl up, and the flowers fall. This variety should no longer be grown. A little-known variety which might, perhaps, replace it is Saxa mange-tout. Jaune de Chine and Sabre à longues cosses are moderately resistant, as is also Conservado, but its resistance is apt to become lowered on some soils. The Flageolets blancs and Hâtif d'Étampes are severely affected, though the Flageolets verts is more resistant than Flageolets blancs in good soil. Nain noir de Belgique shows slight symptoms on the foliage, while Roi des Belges, which is an improved type of this variety, is resistant, and should replace it. Lingot, highly resistant, is strongly recommended.

ZAUMEYER (W. J.) & HARTER (L. L.). **Pintos 5 and 14. New rust-resistant Beans for dryland areas of the west.**—*Sth. Seedsm.*, ix, 8, pp. 15, 50, 54, 3 figs., 1946.

Two new Pinto beans [*Phaseolus vulgaris*], for the present named No. 5 and No. 14 Pinto, combining resistance to rust [*Uromyces appendiculatus*; cf. *R.A.M.*, xxii, p. 88] with tolerance of common [bean] mosaic virus [ibid., xxv, pp. 205, 484], and halo blight [*Pseudomonas medicaginis* var. *phaseolicola*; ibid., xxvi, p. 41], have been developed. These varieties should be released to growers by autumn, 1946. They were both derived from a cross between Idaho Pinto, an early, rust-susceptible type, and the resistant, white-seeded Kentucky Wonder. The new strains are primarily adapted to irrigation culture.

JAUCH (CLOTILDE). **Observaciones sobre infecciones naturales y artificiales de 'Pellicularia filamentosa' (= Corticium solani).** [Observations on natural and artificial infections with '*Pellicularia filamentosa*' (= *Corticium solani*).]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iii, 24, 7 pp., 4 figs., 1947.

In June, 1944, two- to three-month-old broad bean plants at a regional plant quarantine station in Argentina presented large, necrotic lesions along the stems and at their bases, to which they succumbed within a few weeks. Microscopic examination revealed invasion of all the underlying cells by a copious mycelium consisting of hyaline, later ochraceous-buff, septate hyphae, which was identified as that of *Pellicularia filamentosa* (*Corticium solani*) [*R.A.M.*, xxii, p. 372]. The same fungus developed in April, 1945, in eight isolations from chick pea [*Cicer arietinum*] seedlings showing dark, elongated, slightly sunken, basal lesions, two others yielding *Fusarium* sp. Basidia with sterigmata (6 to 13 μ in diameter) and basidiospores (8 to 13 by 4 to 7 μ) arose from the mycelium covering the soil in pot inoculation experiments with isolates of the fungus from the two above-mentioned hosts, pine, and *Iberis*.

The production of the fructifications was expedited under humid conditions at a temperature range of 20° to 25° C. Their formation on the soil itself, besides explaining the wide diffusion of the pathogen, emphasizes the need for stringent precautions to obviate confusion between natural and artificial infection in inoculation experiments.

CAMPACCI (C. A.). **Podridão branca do Alho e da Cebola.** [White rot of Garlic and Onion.]—*Biológico*, xii, 12, pp. 279–281, 1 pl., 1 fig., 1946.

Besides rust (*Puccinia allii*), a disease of major importance on garlic, onions, and other species of *Allium* in São Paulo, Brazil, white rot (*Sclerotium cepivorum*) has been assuming a serious character in the State since 1942 [cf. *R.A.M.*, xxiii, p. 509], when it was first observed on a consignment of garlic from France. The symptoms of the latter disease are briefly described, and recommendations made for its control: by seed selection; the destruction of infected crop refuse by burning *in situ*; crop rotation, allowing an interval of eight to ten years between one garlic

or onion crop and the next; elimination of primary foci of infection by the eradication and burning of diseased stems as soon as they appear; and avoidance as planting sites of very compact soils liable to waterlogging.

CANNON (O. S.). **Fusarium wilt of Spinach.**—*Abstr. Thes. Cornell Univ.*, pp. 327–329, 1944. [Received April, 1947.]

This disease has been reported in several States since 1919 when it was first discovered and the causal fungus named *Fusarium spinaciae* [*R.A.M.*, vi, p. 140]. Annual losses of 5, 3, and 5 to 20 per cent. have been reported for Maryland, Virginia, and Nassau County, New York, respectively. The above-ground symptoms for the young plant are wilting and death while stunting and yellowing precede the wilt on the older specimens. There is a brown discoloration of the tap root, fibrous rootlets, and often the stele, accompanied by reduction in size and number of the rootlets; dark brown to black lesions on infected roots in the field are due to secondary invaders. Spinach wilt is caused by *F. oxysporum* f. *spinaciae* (Sharp) Snyder and Hansen [ibid., xix, p. 495]. Other *F.* sp. of the *Elegans* and *Martiella* sections associated with wilt are found to be only secondary invaders. The pathogen, carried on or in the seed coat, can penetrate uninjured spinach roots and grows mainly in the vascular tissues of the root and hypocotyl. It is far more destructive after having already multiplied in the soil and can live there for many years. Different isolates of the pathogen differ in pathogenicity. Spinach alone of common vegetables is susceptible to the disease. The pathogen grows at from 6° C. to above 33°, best growth occurring at 27° and the optimum pH on buffered agar medium being 5. Spinach was found to survive in previously manured soil while plants died in the same ground without manure; its survival also increased with the added alkalinity of the soil. Sodium nitrite applied at 1,000 lb. per acre reduced wilt and also chloropicrin applied eight days before planting. None of the 126 varieties tested proved resistant but it is thought that resistant varieties of commercial value could be developed. Spinach should not be planted in infested soil during June, July, or August; the pH should be kept neutral with much organic matter incorporated in the soil to reduce risk of infection. If the pathogen is not yet present it can be avoided by rotation.

Seedlings suffering from a dark brown root rot harboured a *F.* sp. differing in morphology and pathogenicity from the wilt pathogen [ibid., xxv, p. 128].

REICHERT (I.), PALTI (J.), MOELLER (S.), HOCHBERG (N.), AVNI (J.), & SAFRAN (B.). **Trials for the control of powdery mildew on wine and dessert Grapes in 1943-1945.**—*Bull. Rehovoth agric. Res. Sta.* 38, 20 pp., 1946. [Hebrew, with abbreviated English translation.]

In 11 further experiments from 1943 to 1945 on the control of vine powdery mildew (*Oidium tuckeri*) [*Uncinula necator*] in three localities in the coastal belt of Palestine [*R.A.M.*, xxiii, p. 427], yellow ground sulphur dust proved generally more reliable than the four sprays tested, namely, the sulfinette and cita brands of lime-sulphur, the dispersible spersul, and the cuprous oxide perenox. The admixture of 30 per cent. lime dust with the sulphur did not impair the efficacy of the latter, which was reduced, however, by a higher proportion (50 per cent.). On the Carignan (wine) variety the first application of sulphur could safely be postponed until the time of flowering, even if foliar symptoms had already appeared. When the first dusting of the Madeleine and Chassas dessert varieties was carried out one to six days after the development of infection on the leaves, the results were equal to those secured by prophylactic treatments. Effective control was given by dusting at 12- to 14-day intervals even under conditions of very severe infection. The schedule resulted in very high percentages of marketable dessert fruit and greatly increased the weight of wine grapes.

Bosc (M.). **Sur la dégénérescence des noyaux et des chloroplastes des cellules de feuilles de Vigne parasitées par Plasmopara viticola (Berk. et Curt.) Berl. et de Toni.** [On the degeneration of the nuclei and chloroplasts of Vine leaf cells parasitized by *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni.]—*C.R. Soc. Biol., Paris*, cxl, 21–22, pp. 834–836, 12 figs., 1946.

Continuing his studies on the cytology of *Plasmopara viticola* in vine leaves [*R.A.M.*, xxvi, p. 283], the author found that the process of nuclear degeneration is accompanied by a progressive reduction in the size of the chromocentres and a disappearance of the chromatin and ultimately of the amorphous nucleus itself. The dissociation of the lipoprotein complexes of the chloroplasts culminates in the fatty degeneration of the latter. There was no trace of the lipoids in severely infected cells, presumably owing to their assimilation by the fungus or obliteration through chemical transformation.

Martinoff (S. I.). Борбата съ пепелницата **Uncinula necator (Schw.) Burr. (Oidium tuckeri Berk.)** по Лозата. [Control of powdery mildew *Uncinula necator* (Schw.) Burr. (*Oidium tuckeri* Berk.) on the Vine.]—Plant Protection Institute, Sofia, 67 pp., 2 diags., 1940. [English summary. Received January, 1947.]

Further experiments were carried out near Varna, Bulgaria, in 1938, to determine the relative efficiency of various sulphur-containing dusts and sprays in the control of vine powdery mildew (*Uncinula necator*) [*R.A.M.*, xvii, p. 726], the schedule comprising four treatments (1) 26th and 27th May, (2) 15th and 16th June, (3) 6th and 7th July, and (4) 29th and 30th July. Sulphur saim (an Italian product derived from ground sulphur ore) and pure sulphur dust gave perfect control, as also did spraying with wetted pure sulphur (1 kg. per 100 l. water plus 2·5 l. resin soap or 8 to 10 beaten eggs) or lime-sulphur (1 in 120 or 1 in 160) with the addition of resin soap. Without an adhesive lime-sulphur reduced the incidence of infection from 23·5 to 2 per cent. The admixture of resin soap with the lime-sulphur resulted in a discoloration of the grapes, unfitting them for the table. Plodorod wettable sulphur (0·5 per cent.) and serol (a paste of sulphur powder and casein) at 1 per cent. were about equally effective with pure lime-sulphur. Sulphur saim, pure sulphur dust, and pure lime-sulphur caused slight blotching of the foliage and fruit, probably due to acidity, which was neutralized by the resin soap and egg adhesives.

McKinney (H. H.). **Stability of labile viruses in desiccated tissue.**—*Phytopathology*, xxxvii, 2, pp. 139–142, 1947.

The viruses of cucumber mosaic, southern celery mosaic [? a strain of cucumber mosaic], tobacco ring spot, potato 'Y' mosaic [potato virus Y], tobacco etch, lucerne mosaic, apical and eyespot mosaics of oats [*R.A.M.*, xxv, p. 554], wheat mosaic rosette, and prairie wheat yellow mosaic [ibid., xxiv, p. 136] are inactivated in a short time (within a few weeks at most) when leaves containing them are dried in the ordinary way in the laboratory. However, when leaves, cut into small pieces are desiccated rapidly over calcium chloride crystals at 1° to 2° C. and then stored in moisture-tight bottles at the same temperature, all except the oats eyespot mosaic virus survived for relatively lengthy periods. The cucumber mosaic virus in maize, for instance, persisted for 669 days, the corresponding periods for southern celery mosaic in maize, tobacco ring spot in tobacco, lucerne mosaic in cucumber, one sample of potato virus Y in tobacco, and tobacco etch in tobacco being 613, 393, 303, 420, and 301, respectively. Another sample of potato virus Y in tobacco persisted for only 78 days, the two wheat mosaic viruses in wheat for 290, and apical mosaic of oats in oats for 177. The cucumber mosaic virus in maize also

survived drying in the oven at 35° for 20 hours and storage over calcium chloride at 23° for periods up to 58 days, and the southern celery mosaic virus in maize withstood drying over calcium chloride in the oven at 35° for 18 hours and storage at 1° to 2° for 27 days.

On the basis of these data the author concludes that the comparatively rapid inactivation of the labile viruses dried at room temperature is not entirely attributable to oxidation or desiccation, other factors, such as fermentation processes, probably being more directly concerned.

The major importance of the host species appears from incidental tests to lie in its capacity for production of a large quantity of virus rather than in any influence it may exert on the survival in the dried material.

BARTHELET (J.) & VINOT (M.). **Notes sur les maladies des cultures méridionales.** [Notes on the diseases of plants grown in the south of France.]—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 11–23, 6 figs., 1944. [Received February, 1947.]

In these notes on plant diseases observed in the south of France [cf. *R.A.M.*, xxvi, p. 216] the authors state that fig trees growing on alluvial soil in the Vallée du Gapeau, Var, are sometimes killed off by root rot generally due to *Armillaria mellea*. Wilt of the same host after frost damage is caused by *Fusarium lateritium* [*Gibberella lateritia*]. Old fig trees show cankers produced by *Phomopsis cinerescens* [ibid., xxiii, p. 33]. On fig leaves two fungi were constantly found in Var and the Alpes-Maritimes, one causing rust (*Kuehneola* [*Cerotelium*] *fici*) [ibid., xxi, p. 99; xxv, p. 475], the other, *Cercospora bolleana* [ibid., xxi, p. 350], causing leaf spot. The latter is common in the Mediterranean area, but does not appear to have been described before for France. It appears from July onwards on the lower leaves and frequently in great abundance on the suckers. Affected leaves show quadrangular, greenish-brown, later darker spots, often confluent, bounded by the secondary veins, on the lower surface, and later brown necrotic spots on the upper surface. The first lesions develop near the main veins. The damage caused is not great and no treatment is necessary.

In the winter of 1942–3 *Foeniculum dulce* [*F. vulgare*] was widely attacked by *Fusicladium depressum* [ibid., ix, p. 613], which caused heavy loss in some plantings. Scattered patches of plants turned yellow and developed leaf wilt. The leaflets dried up, and later on the petioles softened and withered. The resulting growth disturbance caused desiccation of the entire bulbous part of the petioles or arrest of the thickening of these organs. The affected leaflets and petioles showed the presence of numerous brown areas, which on the latter were up to 7 mm. long by 2 mm. wide. The conidiophores measured 50 to 60 by 6 to 7 μ (100 to 120 μ long on old fructifications), while the hyaline, irregular, 2-celled conidia averaged 40 to 45 (occasionally up to 60) by 6 to 7 μ; they were often constricted in the middle.

Every year carrot plantings in the south of France show serious withering of the foliage in autumn, following on the rains that come at the end of September. Entire plots appear as if scorched. The condition is most common in damp places under trees. The petioles and leaflets show numerous ocellate spots, 1 to 4 mm. in diameter with a white centre and a brown, diffuse halo; when very many are present, they act like an annular incision and induce sudden desiccation of the whole leaf. The disease is little known in other parts of France. It would appear to resemble the disease described by Kühn in Germany in 1852, and the causal organism is considered to be identical with that described by him as *Alternaria brassicae* var. *dauci*.

In May, 1940, branches of cypress (*Cupressus macrocarpa*) were received from La Nartelle, Var, bearing large cankers 20 to 30 cm. long. The condition was associated with a fungus agreeing with the description of *Coryneum cardinale* [ibid., xxiv, p. 39].

In June, 1939, a 15-year-old *Phoenix canariensis* tree at Nice showed complete rotting of the terminal bud and bases of the rachids of the adjacent leaves as a result of infection by *Thielaviopsis* [*Ceratostomella*] *paradoxa*. The fungus does not appear to have been recorded previously in France on a living host, and is presumed to have come from North Africa [cf. ibid., xi, p. 510; xiv, p. 429].

KUHNHOLTZ-LORDAT (M.). **Notes de pathologie végétale (suite).** [Notes on plant pathology (continuation).—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 55–63, 11 figs., 1944. [Received February, 1947.]

In these further notes [cf. *R.A.M.*, xxv, p. 381] the author states that horse-chestnut (*Aesculus hippocastanum*) is sometimes affected by a very serious disease of the leaves caused by different species of *Septoria* in different localities. Those found in Europe are *Septoria aesculi* ([spores] 4–5-celled, 50 to 60 by 3 to 3·5 μ), *S. hippocastani* (1-celled, 55 to 60 by 2·5 μ), *S. aesculina* (1-celled, 36 to 44 by 3·5 to 5 μ), and *S. aesculicola* (1-celled, 20 to 30 by 1 μ). In September, 1941, a *Septoria* was found in Lozére (Notre-Dame des Neiges) which did not agree exactly with any of these. The spots were sparse and 2 to 3 mm. in diameter. On the lower surface they were ochraceous with a purplish-brown border. On the upper surface the centre, at first ochre, turned white, and was surrounded by a broad, dark-purple band. A small, black pycnidium (occasionally two) occupied the centre, and its hypophyllous pore emitted in an agglutinated cordon 3-septate, arcuate stylospores, 48 to 54 by 1·6 to 2 μ. The author considers that this form should be referred to *S. aesculi*, which should include a form *major* (*S. aesculi sensu stricto*) and a form *minor*, which is this one from Notre Dame des Neiges.

When the warm, wet winds blow across Languedoc from the Mediterranean, sunflower inflorescences sometimes become infected by *Cladosporium herbarum*. If this occurs during flowering it can impede reproduction, the fungus showing marked predilection for the pollen, which it turns into black clots. This is of frequent occurrence in September, though the seed does not appear to sustain any injury.

Opaque, black teleutospores of certain rusts can be cleared by using Gastaud's mixture [ibid., xxv, p. 381]. They are placed in a drop of lactic acid, and the mixture is added at the edge of the slide; it rapidly diffuses and the teleutospores turn a very clear reddish-brown.

Annual Report of the Science Service, Dominion Department of Agriculture, for the year ended March 31st, 1946.—88 pp., 1946.

The following items are of interest in the Plant Pathology section (pp. 35–40) of this Canadian report [cf. *R.A.M.*, xxiv, p. 491].

At the end of the war many more shipments of nursery stock were intercepted because of disease. No new or rare diseases were found but among seriously diseased shipments were *Narcissus* [bulbs] with 70 per cent. basal rot [*Fusarium bulbigenum*: ibid., xxiii, p. 133] and hyacinths with 80 per cent. yellows (*Xanthomonas hyacinthi*: ibid., xvi, p. 319], both from Holland, and tomato seedlings from the United States with high percentages of bacterial spot [*Xanthomonas vesicatoria*: ibid., xxiv, p. 252].

Studies were continued in Ottawa to determine the prevalence and importance of seed-borne diseases [ibid., xxv, p. 590]. Representative seed samples were examined from 1,145 seed stocks consisting of 595 samples of peas, 195 of flax, 31 of swedes, 9 of tobacco, 200 of vegetables, and 51 of clover and grasses. Each sample was certificated as being (*a*) suited for seeding purposes, (*b*) suitable if seed-treated, or (*c*) unsuitable for seeding purposes. Specific treatments were recommended where necessary.

As the result of a regulation requiring that foundation and elite seed stocks be inspected, passed by the Canadian Seed Growers' Association, 127 crops around

Ottawa and two at Kapus-Kasing were inspected by a plant pathologist. Pea seed heavily infected with *Ascochyta pisi* [ibid., xxvi, p. 91] treated with 1 per cent. ceresan, spergon, or arasan gave considerably higher emergence and pod yield than the untreated, the figures being doubled in the case of spergon and arasan. In attempts to find a relationship between laboratory test data and field incidence for *A. pisi* and *A.* [*Mycosphaerella*] *pinodes* it was found that *A. pisi* had a higher field disease rating with increasing seed infection. No such correlation was evident with *M. pinodes* in any of the 76 seed samples used.

In 1945 an intensive scouting campaign was launched by the Dominion Department of Agriculture in Quebec, Ontario, New Brunswick, and Nova Scotia against the Dutch elm disease (*Ceratostomella ulmi*) [ibid., xxvi, p. 9]. Quebec seemed to have the only infected area, which extended from Quebec City to Lachine and from Richmond to St. Gabriel, an area of 160 miles long by 80 miles at its maximum width. The centre of infection seemed to be Sorel [ibid., xxv, p. 61], where the disease had probably been present for as long as ten years. A total of 1,349 infected trees have so far been found. The vector *Hylurgopinus rufipes*, the native elm-bark beetle, is not supposed to be as effective a carrier as the European bark beetle [*Scolytus scolytus*], but it is doubtful whether this is so in Quebec in view of the widespread occurrence of *C. ulmi* there although only the native beetle occurs. As a measure against the spread of the disease all infected trees were destroyed [ibid., xxii, p. 504], but the results can only be assessed by studying the continued spread of the disease.

In the collection of wood-destroying fungus cultures there are 1,181 named cultures representing 321 species of 57 genera.

Brien (R. M.). **Second supplement to 'A list of plant diseases recorded in New Zealand'.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 221–224, 1946.

This is a list of 54 diseases of fungal, bacterial, virus, and physiological origin on 56 hosts. The records are either of new diseases or additional hosts since the publication of original list (1939) and the first supplement (1942) [*R.A.M.*, xxiii, p. 79]. Mention may be made of *Peronospora antirrhini* on *Antirrhinum majus* [ibid., xxvi, p. 130], *Cylindrosporium concentricum* on cabbage, *Erysiphe cichoracearum* on vegetable marrow, and *Pestalotia guepini* [ibid., xxii, p. 482] on *Camellia japonica*, all new to the country, and of the following additional hosts: *Atropa belladonna* for *Verticillium albo-atrum*, grapefruit for *Phytophthora citrophthora*, vegetable marrow for *Mycosphaerella citrullina* [ibid., xix, p. 66; xxv, p. 23], *Cyphomandra betacea* for *Glomerella cingulata*, *Dipsacus fullonum*, *Gerbera* sp., and *Hyoscyamus niger* for *Sclerotinia sclerotiorum*, loquat for *Fabraea maculata*, *Escallonia macrantha* for *Stereum purpureum*, flax for *Botrytis cinerea*, and apricot for *V. dahliae*.

New plant diseases.—*Agric. Gaz. N.S.W.*, lviii, 2, p. 94, 1947.

The following were recorded for the first time in New South Wales during the year ended 31st December, 1946: crown rot (*Rhizoctonia* [*Corticium*] *solani*) on celery, *Sclerotinia* stem rot (*S. sclerotiorum*) on sweet pea, American common blight (*Xanthomonas phaseoli* var. *fuscans*) on French bean (*Phaseolus vulgaris*), *Entyloma physalidis* on Cape gooseberry (*Physalis peruviana*), and die-back and canker (*Cytospora* [*Valsa*] *chrysosperma*) on Carolina poplar (*Populus deltoides*) [*R.A.M.*, xix, p. 623].

Leckie (W. G.). **Basutoland. Annual Report of the Department of Agriculture for the year ended 30th September, 1946.**—28 pp. [? 1947.]

In this report it is stated that all wheat seed issued by the Department of Agriculture (over 3,000 bags in 1945–6) is treated with copper carbonate against

smut [? bunt: *Tilletia caries* and *T. foetens*: cf. *R.A.M.*, x, p. 679]. Grain visibly infected is not permitted to be sold. As a result of these measures bunt has been very light in recent years.

WATERSTON (J. M.). **Report of the Plant Pathologist, 1946.**—Department of Agriculture, Bermuda, 18 pp., 4 figs., 2 maps, 1947.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xxvi, p. 96]. Within the limits of a late-season test, Dupont sulforon wettable sulphur, 8 lb. in 100 gals. water, proved more effective than 2 lb. fermate plus 5 fl. oz. Dupont spreader-sticker in 100 gals. in the control of fig rust (*Cerotelium fici*) [ibid., xx, p. 124, and above, p. 328]. New hosts of *Sclerotinia sclerotiorum* recorded during the year were aster, papaw, periwinkle (*Catharanthus roseus*) [*Vinca rosea*], *Iberis umbellata*, and *Petunia hybrida*. A species of *Oidium* was found on *Linaria vulgaris* and *Puccinia coronata* on *Lolium multiflorum*, both for the first time in Bermuda.

DYER (R. A.). **Protection and classification of plants.**—*Fmg S. Afr.*, xxii, 251, pp. 269–273, 1947.

The following items are reported in the plant pathology section of the Annual Report of the Department of Agriculture for the year ended 31st August, 1946 [cf. *R.A.M.*, xxiv, p. 402]. The production of virus-free potato 'seed' at the Riet River Settlement [ibid., xxiv, p. 384] was cut to 2,000 bags, sufficient for the settlers who took over the land at the end of the summer. Previously, seed potatoes have been cultivated in areas relatively free from aphids carrying virus diseases. Now, however, owing to shortage of such land an attempt is being made to produce vigorous 'seed' stocks in areas where some aphids are found.

Bacterial wilt of tomato and eggplant [*Xanthomonas solanacearum*: ibid., xxv, p. 536] is still prevalent. The resistant strains of eggplant distributed from the Botanic Station, Durban, are very popular and satisfactory but so far no resistant tomato variety has been found.

Spraying or dusting mangoes with 50 : 50 sulphur–copper mixture effectively controls *Erysiphe cichoracearum*, anthracnose [*Gloeosporium mangiferae*: ibid., xxii, p. 215], and a new inflorescence blight, caused by *Physalospora perseae*, which is very destructive in the Eastern Transvaal.

In 1946, young wheat plants were commonly attacked by orange leaf [brown] rust (*Puccinia triticina*) and mildew (*Erysiphe graminis*). Root rot due to *Helminthosporium sativum* was more prevalent, but the affected plants were stunted and this stunting was later found to be due to the maize streak virus [ibid., xxvi, p. 194]. This disease occurs throughout the Transvaal wheat areas and is its most important disease. Maize streak, although prevalent in late summer, was absent in early plantings probably because of the prolonged drought or the severe winter of 1945. This virus was shown to infect wheat, barley, rye, and oats. The small grains are probably instrumental in carrying the infection from one crop to another. No South African maize varieties are immune from the disease and all those from the United States are highly susceptible. One variety of *Euchlaena mexicana* and one of *E. perennis* proved immune and may provide a breeding basis for resistant varieties. A few Canadian wheat varieties are resistant.

An ear rot of maize new for South Africa caused by *Basisporium gallarum* [*Nigrospora oyzae*] is reported. The damp weather favoured damage from the ear rot due to *Gibberella fujikuroi* [ibid., xxii, p. 475].

The damage from loose smut of oats (*Ustilago avenae*) varied from 30 to 80 per cent., and was caused by insufficient seed disinfection. Losses from covered smut of barley (*U. hordei*) never exceeded 5 per cent.

There has been another outbreak of potato wart disease (*Synchytrium endobioticum*) at Volksrust, Wakkerstroom, and Charlestown, indicating that the disease has not yet been eradicated as had been hoped [ibid., xxiv, p. 402]. Quarantine measures have been applied. Sugar-cane mosaic disease [ibid., xxvi, p. 30] has also occurred again recently but in mild form on Co. 281 and Co. 301 with patches of high infestation on a few estates. When the sugar industry switched from the mosaic-immune Uba variety to the resistant Co. types a few years ago it was believed that all remaining susceptible varieties were destroyed. It is now evident that a source of infection remained probably in native grasses (*Setaria* sp.) and spread from there to the cane fields.

Owing to the presence of stem-pitting, a disease of obscure origin believed to be transmitted by budding, the scheme for certification of parent trees of grapefruit against psorosis [virus] has been abandoned. The scheme of certification for parent orange-trees is going well, although the general inspection of citrus orchards for scaly bark [psorosis] has been reduced to allow for other necessary inspections.

Inspection of vineyards for bacterial blight [*Erwinia vitivora*: ibid., xx, p. 151] is being continued very slowly. About 13,000,000 vines and 200 registered nurseries were examined in Somerset West, Stellenbosch, Paarl, Wellington, Worcester, Robertson, Montagu, Swellendam, Bonnievale, Tulbagh, and Caledon. The farms of two registered nurserymen were placed in quarantine owing to infection.

Research and farming 1943. Sixty-sixth Annual Report of the North Carolina Agricultural Experiment Station, 1942–3.—122 pp., 68 figs., 1943.

The following items of interest are in this report [cf. *R.A.M.*, xxiv, p. 405]. Semesan-treated and untreated maize seed was grown at three different Stations in North Carolina. A 1·5 per cent. increase in stand resulted at the Piedmont Branch Station Farm, a 5 per cent. increase at the Upper Coastal Plain Branch Station, and none at Blackland. The differences are possibly related to conditions during the germination period. The small cost of treatment (7 cents per bush.) is considered to be, however, a reasonable insurance against poor stands.

It was proved during tests in 1943 at the Upper Coastal Plain Branch and McCullers Stations that less treated cotton seed was required than untreated to make a satisfactory stand. Du Bay 1452–C was found to be the most efficient seed protectant, new improved ceresan, arasan, Dow No. 5, GCC No. 1, and spergon also giving highly significant increases in yield in that order.

Du Bay 1452–C and spergon seem promising for groundnut seed treatment. Treatment with arasan, 2 per cent. ceresan, or yellow cuprocide resulted in 75 per cent. germination and spergon in 68 per cent. compared with 54 in the untreated [ibid., xxv, p. 332]. It was also shown that the seed of the Virginia Bunch variety can be safely treated and stored for any reasonable time before planting [ibid., xxv, p. 249]. Systematic counts showed that *Cercospora* leaf spot (*C. arachidicola* and *C. personata*) is less severe when the groundnuts are used in rotations than in continuous culture. Overwintering sclerotic tissue produces conidia the next spring (late May in the Upper Coastal Plains). They are increased by damp, warm weather and periods of heavy dew and are spread some distance by wind, insects, particularly leaf-hoppers [ibid., xxv, p. 536], and water currents from flooded rows. Inoculations with conidia showed that the incubation period for *C. arachidicola* was 7 to 10 days and for *C. personata* 12 to 20; that infection takes place equally well whatever the weather conditions or age of plant; that Spanish types are the most susceptible; and that dusting not later than eight days after inoculation gave 100 per cent. control and remained effective for two weeks. Spanish seed groundnuts are the better if shelled and treated at planting time; unshelled seeds must be used in greater quantities to get satisfactory results. Significant increases in

nodulation and yields of Virginia Bunch were gained when soils naturally or artificially contaminated with nodule-forming bacteria were added to soils not previously planted with groundnuts; seed treatment just before planting did not seem to interfere with nodulation when this method was used.

The bacterial pustule disease [*Xanthomonas phaseoli* var. *sojense*] causing defoliation of soy-bean is very prevalent in North Carolina and survives the winter in dead leaves and some seeds from diseased plants. Seed treatment failed to check the disease and growers are recommended to use either resistant varieties or seed from fields hardly attacked by the disease. The Ogden, Otootan, Palmetto, and Woods Yellow varieties were found to be rather more resistant than others. A second and as yet unidentified leaf-spotting bacterial disease was found in 1942 and 1943 and under some conditions was even more destructive.

New spray treatments against tobacco blue mould [*Peronospora tabacina*] were tried during 1943; bismuth subsalicylate at 12 oz. in 50 gals. spray with 8 oz. vatsol O.T.C. as wetting agent and fermate 1 lb. in 50 gals., wetting agent optional, both proved equal or superior to the regular copper oxide-oil mixture [ibid., xxvi, pp. 33, 135]. Tobaccos resistant to Granville wilt [*X. solanacearum*] showed good quality and yield in 1943 when planted in contaminated soil; hybrids of T.I. 448 A parentage showed less than 5 per cent. wilt where standard varieties were a complete loss. A soil treatment with uramon at 1,000 lb. per acre on contaminated soil yielded a good crop after a maize rotation [ibid., xxiii, p. 460].

In order to combat the now serious bacterial wilt of tomato [*X. solanacearum*] resistant lines are being developed and field tests showed that the progeny of the cross between Louisiana Pink and T 414 (from Porto Rico—P.I. No. 3814) were highly resistant compared with other crosses.

During seed treatments of lettuce the materials found to be very beneficial were yellow cuprocide and spergon which gave from 10 to more than 100 per cent. stand increases and allowed a much lower rate of seeding.

The apple diseases black rot (*Physalospora obtusa*] and bitter rot [*Glomerella cingulata*: ibid., xxiv, p. 195] reached epidemic proportions in 1943. Bordeaux 4–4–50 was again most effective in controlling bitter rot; the weaker concentration (1–3–50) did not reduce spray injury as effectively as in previous years. Of the substitutes tried only fermate was found to equal Bordeaux in bitter-rot control. Fermate used at 3–5–10 was also found to be most effective for controlling black rot, the next best being Bordeaux at 4–4–50 and Tennessee copper '26' at 3–3–50.

DESLANDES (J. A.). **Observações fitopatológicos na Amazônia.** [Phytopathological observations in Amazonia.]—*Bol. fitossan. Minist. Agric., Rio de J.*, i, 3–4, pp. 197–242, 5 col. pl., 23 figs., 1944. [Received May, 1947.]

The main object of the author's first visit to Pará in November and December, 1937, was to verify a rumour, which proved to be unfounded, as to the occurrence of cotton wilt (*Fusarium vasinfectum*) in the State. On the second occasion, in June and July, 1944, the tour of inspection also covered Amazonia. Among the pathogens affecting the crop in Pará, mostly in a mild form, are *Ramularia areola*, *Cercospora* (?) *gossypina*, *Bacterium* [*Xanthomonas*] *malvacearum*, and *Colletotrichum gossypii* var. *cephalosporioides* [*R.A.M.*, xviii, p. 798].

A root rot of cassava in waterlogged soils in Amazonia was tentatively attributed to asphyxiation, a similar condition also being noted near Belém, Pará. *Phytomonas manihotis* [cf. ibid., xxv, p. 103; xxvi, p. 287] was found to be coextensive with the cultivation of cassava, but the damage caused was usually slight. The leaf spots due to *Cercospora caribaea* and *C. henningsii* [ibid., xx, p. 445] were likewise present but unimportant.

Two major banana diseases, viz., Sigatoka (*C. musae*) [*Mycosphaerella musicola*] and Panama (*Fusarium oxysporum* var. *cubense*), occur in both States, while

Chloridium musae [ibid., xxv, p. 220] and *Cordana* [*Scolecotrichum*] *musae* were commonly encountered in Amazonia.

A species of *Corticium*, believed by Dr. A. Bitancourt to be new to science, is responsible for the so-called 'areolate spot' of *Hevea* rubber leaves, consisting of necrotic, chestnut- or light-coloured areas which are disposed in rings, haloes, or other patterns, and become perforated or lacerated by the wind. There are two centres of infection in Pará, where the disease was first recognized in 1943, one at Belterra and the other at Belém, and cases have also been reported from Manaus, Amazonia. The leaf spot, to which C. Townsend, of the Ford Company, attributes considerable economic importance, attacks plants of all ages. Besides *H. brasiliensis*, *H. pauciflora*, *H. benthamiana*, *H. spruceana*, and *H. guayanensis* are susceptible. The ready transmissibility of infection may be gauged by the incidental observation that a number of scions dipped before grafting in water previously used to obtain spore suspensions from diseased foliage contracted the leaf-spot symptoms.

Mention has already been made of the Ford Company's energetic campaign against *Dothidella* [or *Melanopsammopsis*] *ulei* in Amazonia [ibid., xxv, p. 72]. The method employed in the production of resistant budding material consists in forcing growth from the upper parts of the stems of selected trees. In 1944 the young shoots were observed to be suffering from a disease closely resembling the above-mentioned cassava bacteriosis both in its external and internal features. Cultures from the infected tissues failed to yield any micro-organisms, but a bacterium is presumed to be concerned in the etiology of the trouble. *D. ulei*, *Diplodia* sp., and *Gloeosporium* sp. were found on the dead branches. Since the disease involves valuable breeding material it is of potential economic importance and precautions are being taken to prevent its spread on the Ford Company's estates.

The incidence of pink disease (*C. salmonicolor*) appears to be limited to one plantation at Belém, Pará. Other organisms occurring on rubber are *Catacauma huberi* [ibid., v, p. 324], *Phytophthora palmivora*, *Phyllosticta* (?) *heveae*, *Cephaleuros virescens* [*C. mycoidea*], and *Sphaeronema fimbriatum* [*Ceratostomella fimbriata*].

The Amazonian cacao plantings suffer from the ravages of witches' broom (*Marasmius perniciosus*) [ibid., xxvi, p. 287]. In the Belém region of Pará, *Theobroma grandiflora* sustains even heavier damage from the disease than cacao itself and acts as a copious source of infection, which should not be overlooked in the organization of control measures. *Phytophthora palmivora*, a limiting factor in cacao production in Bahia [loc. cit.], is also rife in Amazonia, but data and observations relating to pod rot in the latter State are lacking. Secondary deterioration of the pods is associated with the ubiquitous *Lasiodiplodia* [*Botryodiplodia*] *theobromae*, which is also responsible in a primary capacity for black rot. A few cases of thread blight (*Corticium koleroga*), referred by Briton Jones to *Marasmius* [ibid., xiii, p. 540], were noted, other hosts of the same fungus including coffee, *Syzygium jambolana*, mango, and orange. On large mango trees, notably in dense, heavily shaded plantings in Manaus and Igaropé–Açu, extensive areas of the crown were shrivelled and whitened by the adherent leaves, on which the framework of the mid and lateral veins was thickly coated with the fungus.

The blight caused by *C. microsclerotia* [ibid., xix, p. 3] was observed for the first time in Pará in June, 1944, the most susceptible hosts apparently being various types of French and Lima beans [*Phaseolus vulgaris* and *P. lunatus*] and cowpea. Severe infection was further observed on turnip, mustard, okra (*Hibiscus esculentus*], and castor [*Ricinus communis*], while material for examination was also collected on sugar-cane, cassava, potato, eggplant, papaw, cucumber, radish, and *Dolichos lablab*.

Among the diseases of miscellaneous plants may be mentioned an extensive circular, zonate spotting of the lower leaf surfaces of mulberry at Manaus by a

species of *Cephalosporium*, and the more prevalent foliar infections due to *Mycosphaerella mori* and *Cercospora* sp.

Among the fungi observed on rice leaves were *C.* (?) *oryzae*, *Piricularia oryzae*, and a *Helminthosporium* sp.

Cashew nut [*Anacardium occidentale*] leaves bore lesions caused by *Cephaleuros mycoidea*, *Gloeosporium* sp., and *Parodiella* sp., the last-named being apparently parasitized by a species of *Cicinnobolus*.

The Amazonian sugar-cane crop seemed to be very healthy, mosaic being detected only in insignificant traces, even in the old indigenous varieties: other organisms noted were *Leptosphaeria sacchari*, *Melanconium* [*Pleocyta*] *sacchari*, and *Schizophyllum commune*.

Leandria momordicae, *Oidium* sp., and *Acremonium* sp. occurred on the foliage of vegetable marrow, cucumber, melon, and other cucurbits, cucumbers also being infected by *Peronosplasmopara* [*Pseudoperonospora*] *cubensis* and vegetable marrows by *Rhagdolobium cucurbitacearum*.

Tobacco showed infection by the tobacco-mosaic virus and *Cercospora nicotianae*, while other observations included *Phytomonas* [*X.*] *solanacearum* on eggplant and chilli, the latter also being attacked by *Sclerotium rolfsii*, *C. beticola* on beet, *Macrosporium* [*Alternaria*] *porri* and *M. parasiticum* [*Pleospora herbarum*] on onion, *C. hibiscina* on *H. esculentus*, a dry root rot of jak tree caused by an undetermined species of *Rosellinia* (the only case of this disease yet recorded in Amazonia), *X. solanacearum* in a devastating form on tomato, precluding the cultivation of the crop in certain localities and seasons, and milder infection of the same host by *Cladosporium fulvum*, *Septoria lycopersici*, and *Sclerotium rolfsii*.

Septobasidium spp. were the most prevalent entomogenous fungi, followed by *Aschersonia* spp., e.g., *A. basicystis*, *A. turbinata*, and *A. aleyrodis* [ibid., xxvi, p. 130], *Hirsutella verticillioides* on the rubber pest, *Leptopharsa heveae*, *Acrostalagmus*, *Podonectria*, and *Sphaerostilbe* spp. on citrus coccids, and *Myriangium duriaei* [ibid., xx, p. 61] on the mulberry aphid.

De Ropp (R. S.). **The isolation and behaviour of bacteria-free crown-gall tissue from primary galls of Helianthus annuus.**—*Phytopathology*, xxxvii, 4, pp. 201–206, 3 figs., 1947.

Unlike the tissues isolated from crown galls (*Phytomonas* [*Bacterium*] *tumefaciens*) on tobacco and tomato, which uniformly contained viable bacteria, the interior tissues of primary galls on sunflowers were frequently found to be free of the pathogen and new strains of tissue similarly devoid of the organism could be obtained from the same source [*R.A.M.*, xxvi, p. 289]. Tumour tissue thus procured was usually mixed with normal material and tended to throw out roots for some time after its original isolation. These roots are thought to have arisen from fragments of normal tissue embedded in the excrescences and stimulated into activity by growth substances generated by the crown galls.

The primary galls yielded two types of tissue, one hard and woody with a fairly well-defined internal structure, and the other soft and translucent. On prolonged culture the former was inclined to change into the latter.

Greenwood (M.) & Posnette (A. F.). **A morphological change induced in leaves of Theobroma cacao by mineral deficiency.**—*Nature, Lond.*, clix, 4042, pp. 542–544, 3 figs., 1947.

In the course of breeding work against swollen shoot, symptoms of lime-induced chlorosis appeared on cacao seedlings potted in a mixture of soil, compost, and marine sand containing a high percentage of shell, and which had been watered with limed water. In addition to symptoms of acute iron deficiency [*R.A.M.*, xxiv,

p. 11], some plants showed sharp dentations at the leaf tip. This deformity occurred in an exaggerated form in cacao seedlings grown in water cultures without iron and manganese. The basic solution of Reeve and Shive (*Soil Sci.*, lvii, p. 1, tab. 1, 1944) was used at a potassium concentration of 50 p.p.m. plus 0·5 p.p.m. each of boron and zinc, and adjusted weekly to pH 6. There were four replicates, all of which gave deeply indentate leaves in a flush that developed 11 to 13 weeks after transference to culture. Eleven out of a total of 15 leaves were chlorotic and later developed leaf-scorch. The plants ceased elongation after 20 weeks in culture and produced no more leaves before dying.

The four plants had been selected at random from twenty seedlings grown for 11 weeks in quartz sand and distilled water. The remaining sixteen seedlings, grown under parallel conditions in solutions containing 1 p.p.m. iron and 0·25 p.p.m. manganese, had entire leaves. Only entire leaves were formed by a second series of forty plants, including eight lacking only iron and eight only manganese, grown for periods of up to 30 weeks in the same basic solution.

ANDRÉN (F.). **Resultat av betningsförsök met stråsäd.** [Results of disinfection experiments with cereal seed.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 1, pp. 1–4, 1947.

A tabulated account is given of the 1944–5 and 1945–6 seed-grain disinfection experiments at the Stockholm Plant Protection Institute [cf. *R.A.M.*, xxv, p. 207]. The incidence of loose smut of oats [*Ustilago avenae*] in the summer crop of 1945 was reduced from 27·6 plants per 10 sq. m. in the untreated plots to 0·2 by betoxin 61 (at the rate of 300 gm. per 100 kg.), panogén (200 ml.), and uspulun (300 gm.); to 0·3 by fusariol dust, panogén (400 ml.), and uspulun (600 gm.), to 1·6 by abavit-neu (300 gm.), and to 3·9 by germisan (300 gm.). Uspulun (300 gm.) gave the largest yield (3,514 kg. per ha. compared with 3,314 in the control plots), followed by betoxin 61 (3,484 kg.). The most effective control of barley stripe [*Helminthosporium gramineum*] was obtained with double dosage of panogén (400 ml.), which reduced the number of diseased plants per 10 sq. m. from 451·8 to 0·5. In none of the other treatments did the corresponding figure fall below 1 to 2, and in the plots from germisan-dusted seed it was 3·5. Panogén at 400 ml. likewise resulted in the heaviest yield (3,542 kg. per ha., compared with 3,285 in the control plots), closely followed by betoxin 61 (200 gm.), uspulun (200 gm.), and germisan (3,536, 3,531, and 3,530 kg., respectively).

The above-mentioned preparations, with the addition of liquid uspulun (0·125 per cent.) and germisan (0·1 per cent.), were also tested against rye fusarioses [including *Calonectria graminicola*] and wheat bunt [*Tilletia caries* and *T. foetida*] in the 1945–6 winter crops with satisfactory results. There were no remarkable differences in efficiency between the various chemicals.

In 1946 summer oats and barley crops were treated against *U. avenae* and *H. gramineum*. Lunasan (300 gm.), agrosan GN [ibid., xxii, p. 56] (350 gm.), and semenon (a Finnish product) (300 gm.) reduced the number of smutted oat plants per 10 sq. m. from 20·2 to 0·2, 0·5, and 0·3, respectively, and raised the yield from 2,825 to 2,891, 2,944, and 2,840 kg. per ha., respectively. The corresponding figures for panogén, betoxin 61, and uspulun dust were 0·7, 0, and 0·3 infected plants and 2,921, 2,794, and 2,850 kg. per ha., respectively. It is apparent from these data that lunasan, agrosan GN, and semenon are of approximately equal efficacy with the standard Swedish preparations, of which betoxin 61 entirely eliminated loose smut, as also did mercuric chloride-formalin. The number of striped barley plants was reduced from 223·5 to 0·5, 1, 1·2, 1·5, and 1·6 per 10 sq. m. by betoxin 61 (200 gm.), semenon (200 gm.), lunasan (200 gm.), agrosan GN (300 gm.), and panogén. The maximum yield of 3,681 kg. per ha. as compared with 3,167 in the control plots was obtained with lunasan.

AUSEMUS (E. R.), STAKMAN (E. C.), HANSON (E. W.), GEDDES (W. F.), & MERRITT (P. P.). **Newthatch Wheat.**—*Tech. Bull. Minn. agric. Exp. Sta.* 166, 20 pp., 2 figs., 1944. [Received May, 1947.]

The wheat variety Newthatch, produced by crossing the Hope and Thatcher varieties and back-crossing to Thatcher twice, is resistant to both stem [black] rust [*Puccinia graminis*] and leaf [brown] rust [*P. triticina*: *R.A.M.*, xxv, p. 297]. It gave consistently high yields but seemed better adapted to the spring wheat areas. In tests to determine the reaction to bunt [*Tilletia caries* and *T. foetida*], scab [*Gibberella zeae* and *Fusarium* spp.], root rot [*Helminthosporium sativum* and *Pythium* sp.], and black chaff (*Bacterium* [*Xanthomonas*] *translucens* var. *undulosum*) Newthatch was more susceptible than Thatcher. It resembles Thatcher in appearance, having approximately the same date of heading and maturity, height, seed characters, and ability to withstand lodging.

PETIT (A.). **Les charbons de l'Orge et de l'Avoine en Tunisie. Transmission et moyens de préservation.** [The smuts of Barley and Oats in Tunis. Transmission and preventive measures.]—*Bull. Serv. Bot. Agron. Tunis* 3, 12 pp., 1946.

This bulletin describes the transmission of the covered smut of barley [*Ustilago hordei*] and the loose and covered smuts of oats [*U. avenae* and *U. kolleri*] and recommends immersion in formalin and the sprinkling method as wet treatments for both cereals. The dry sulphur treatment, 350 gm. per quintal, is advocated for barley and the dry copper treatment for oats.

YOUNG (G. Y.), LEFEBVRE (C. L.), & JOHNSON (A. G.). **Helminthosporium rostratum on Corn, Sorghum, and Pearl Millet.**—*Phytopathology*, xxxvii, 3, pp. 180–183, 2 figs., 1947.

Helminthosporium rostratum, originally described by Drechsler [*R.A.M.*, iii, p. 65] and tentatively reported by Bunting on maize in the Gold Coast [ibid., vii, p. 231], was isolated in 1944 from leaf spots on the same host from Mississippi and Georgia, on various types of sorghum and Sudan grass from Florida, and on Pearl millet (*Pennisetum glaucum*) [*P. typhoides*] from Georgia. Six cultures from the foregoing sources were pathogenic on the several hosts in inoculation experiments, maize and *P. glaucum* being the most susceptible and the sorghums, especially Leoti, highly resistant.

LEVITT (E. C.). **Armillaria root rot control.**—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 67, 71, 2 figs., 1947.

A cheaper method has been devised to control *Armillaria mellea* root rot of citrus in which a jet of water is used to expose crown roots instead of an air jet [*R.A.M.*, xxvi, p. 74]. A tractor-drawn spray plant carrying a single nozzle fitted with a $\frac{1}{8}$-in. aperture plate only is operated at 250 to 300 lb. per sq. in. In soil considered too hard for hand-working the crown roots were safely bared in $3\frac{1}{2}$ to 5 minutes; the water used ranged from 9 to 14 gals. per tree.

ARNOT (R. H.). **Potassium deficiency in coastal soils. A cause of decline in Citrus and Passion Fruit.**—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 72–74, 1 fig., 1947.

A condition of decline ('burnt leaf') of orange trees in the Gosford and Moorlands districts of New South Wales, and of passion fruit vines at Moorlands and Mangrove Mountain is found to be associated with an abnormally small amount (less than 0·2 per cent.) of potassium [*R.A.M.*, xvi, p. 313; xxii, p. 63; xxiii, p. 386] in the tissues. The condition usually occurs on grey, sandy, low-lying soil commencing in spring with weak new growth followed by a die-back at the base. The twig develops a necrotic spot just above the previous season's growth, yellows, and dies

while the mature leaves also turn yellow. Fruit yield is very poor and in bad cases the tree may be nearly defoliated. Field trials with potash fertilizers yielded promising results. Since the spring of 1938 the decline has occurred sporadically on oranges but occurred only in 1945 on passion fruit.

[The information concerning citrus decline is also given in *J. Aust. Inst. agric. Sci.*, xii, 3, pp. 110–113, 1 fig., 1946.]

ASTHANA (R. P.). **Bacterial root-rot of Citrus.**—*Mag. agric. Coll. Nagpur*, xxi, 3–4, pp. 77–79. 1947.

Dead, dark brown cracks up to 2 cm. long and patches were observed on the roots of orange and mosambi (*Citrus sinensis*) plants exhibiting die-back symptoms of yellowing, sudden wilt, and decline. In advanced stages the bark cracked longitudinally, rotted, and fell off. In a few cases wither-tip was also noticed [*R.A.M.*, xiii, p. 436], but this bears no specific relationship to the root rot which is attributed to bacteria. Bacteria were the sole isolate in the early stages of infection, but a species of *Fusarium*, later shown to be non-pathogenic, was invariably associated in advanced stages. Pathogenicity of the bacterium was established in inoculation experiments with two $1\frac{1}{2}$-year-old healthy orange plants which developed the brown, necrotic spots on the roots and the yellowing of the leaves within five days of the inoculation. The same bacterium was obtained on reisolation and was found in the roots with a gum-like substance in the xylem vessels as in naturally affected roots. Further work is in progress on what is thought to be a new species of bacterium.

BLISS (D. E.). **The use of fungicides against spoilage in Dates.**—*Rep. Date Grs' Inst., 1946*, pp. 13–17, 1946.

An account is given of field experiments carried out from 1940 to 1945 in California to find a non-toxic fungicide to prevent fruit spoilage of dates due chiefly to *Aspergillus niger*, *A. citri*, and *Pleospora herbarum* [*R.A.M.*, xx, pp. 254, 255]. Eleven fungicides were applied during this period on dates mainly of the Deglet Noor variety, 1945 being the only year when the weather caused serious fruit spoilage.

Significant spoilage reductions were obtained after the following treatments: sulphur dust in 1943; sulphur dust and the same plus 5 per cent. fermate in 1944; the fermate–sulphur mixture and a dust containing 10 per cent. yellow cuprocide plus sulphur in 1945. In 1945 fermate–sulphur mixture kept the spoilage down to 11·11 per cent. compared with 53·18 among the untreated dates.

In the laboratory the fungicides were satisfactorily removed with a dried cloth while a shaker-table lined with towelling or rotating brushes gave good cleaning results in the packing-house; the dark colour of the fermate–sulphur residue rendered it less conspicuous. These fungicides did not greatly alter the palatability of the dates and those treated with the fermate–sulphur mixture were thought to be essentially as palatable, attractive, and free from poisonous effects as the non-treated fruits.

It is suggested to growers wishing to test the 5 per cent. fermate in sulphur dust that since this is a fruit protectant with acaricidal properties against the date mite [*Paratetranychus*] as well as being fungicidal, it is desirable to maintain a thorough coverage of all fruit surfaces from midsummer until fruit maturity.

CHRISTIDIS (B. G.). Ἀπολύμανση τοῦ βαμβακόσπορου γιὰ νὰ προστατευθοῦν τὰ βαμβάκια στῇ μικρῇ τοὺς ἡλικίᾳ. [Cotton seed treatment for controlling seedling diseases.]—*Sci. Bull. Cott. Res. Inst., Sindos*, 1, pp. 23–32, 3 graphs, 1947. [Greek, with abridged English translation.]

This is an account of cotton seed treatment in Greece from 1943 to 1946 against a damping-off disease caused by unspecified organisms [*R.A.M.*, xxv, p. 261]. The

results, although mainly satisfactory, were greatly influenced by variety and environmental conditions. Acala always responded well to seed treatment, while others, such as $12 \chi 8$ and $6 \chi 17$, were satisfactory with or without treatment. The treatment naturally was more effective under conditions favourable to the damping-off organisms, disinfection being essential for early sowings. Road dust significantly increased seedling emergence almost as much as ceresan, while wood ashes slightly lowered seedling survival without affecting the yield, and lime proved indifferent. Dust was applied at 6 gm. ceresan or 3 gm. granosan per kg. seed with a higher rate for fuzzy than for delinted. This dust treatment seems preferable to disinfection by sulphuric acid.

McKay (R.). **Flax diseases.**—55 pp., 23 pl., Dublin, Flax Development Board, 1947. 5*s*. 0*d*.

Finding in the course of a survey of flax diseases in Eire in 1945 that the scattered information on this subject in scientific and agricultural journals was totally inaccessible to the ordinary farmer, the author compiled in a simple and readable form the essential facts concerning the principal maladies of the crop. These fall into four sections, viz., (i) fungus diseases, comprising seedling blight (*Colletotrichum linicola*), stem break and browning (*Polyspora lini*), rust and firing (*Melampsora lini*), grey mould (*Botrytis cinerea*), flax wilt (*Fusarium lini*), *Sclerotinia* disease (*S. sclerotiorum*), damping-off (*B. cinerea, C. linicola, Thielaviopsis basicola, Rhizoctonia*, etc.), root rot (*T. basicola*), *Rhizoctonia* sp. (apparently distinct from the potato strain [*Corticium solani*]), powdery mildew (*Erysiphe polygoni*), pasmo (*Sphaerella linorum*), and *Alternaria* sp.; (ii) parasitic flowering plants; (iii) non-parasitic troubles, including 'droop' [*R.A.M.*, xxiii, p. 17]; and (iv) insect pests. Bibliographical references and a useful glossary of scientific terms are provided.

Black (M. A.). **Effect of ceresan on the germination of stored Linen-Flax seed.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 217–218, 1946.

Ceresan treatment, wet or dry, did not reduce the germinability of Concurrent linen-flax seed stored at moderate temperature (55° to 75° F.) and low humidity (average 50 per cent.) for 3½ years at the Plant Research Bureau, Lincoln, New Zealand.

Neergaard (P.). **Sygdomme og Skadedyr paa Stueplanter. 2. forøgede Udgave.** [Diseases and pests of indoor plants. Second enlarged edition.]—64 pp., 34 figs., Copenhagen, J. F. Clausens Forlag, 1946.

This well-illustrated booklet falls into three sections, of which the first deals in general terms with the physiogenic and infectious diseases and with the pests of indoor plants in Denmark [*R.A.M.*, xxv, p. 343]; the second lists the several disorders of individual plants; and the third comprises recommendations for prophylaxis by hygienic methods of cultivation and direct control with fungicides and insecticides.

Le Beau (F. J.). **A fungicide for protecting Lily bulbs from infection by Colletotrichum lilii.**—*Phytopathology*, xxxvii, 3, pp. 194–196, 1 fig., 1947.

The use of puratized N5E for the control of Easter lily (*Lilium longiflorum* var. *eximium*) bulb infection by black scale (*Colletotrichum lilii*) in Louisiana [*R.A.M.*, xxiii, p. 487] was reported in *Phytopathology*, xxxvi, pp. 391–393, 1946. Subsequent tests showed that the chemical, while destroying the fungus in diseased tissue, conferred little or no protection against re-infection from contaminated soil. Encouraging results having been given in preliminary greenhouse tests in 1944 by dusting infected bulbs with arasan after treatment with puratized N5X,

three series of field trials were carried out in 1945–6 to compare the effects of a combined treatment using puratized N5E (1 in 2,000, 48 hours' immersion) and arasan dust treatment (applied 24 hours later) with either alone on diseased bulbs planted in infested soil, arasan also being used on clean bulbs. Neither fungicide was effective by itself, but the combination proved highly successful in the eradication of the fungus from the diseased tissues, while dusting with arasan alone prevented black-scale development on bulbs in infested soil.

Disease indices for the various treatments were obtained by adding the products of the numbers of bulbs in each class, viz., clean, mildly, moderately, and severely diseased, and the numerical values of the classes 0, 33·3, 66·6, and 100, respectively, and dividing by the total number of bulbs in each treatment. On this basis the indices for the two combination-treatment tests were 4·3 and 5·1 and for arasan alone on clean bulbs 4·9, the corresponding figures for the controls being 97·7 and 41, puratized N5E 48·9 and 26, and arasan on diseased bulbs 72·3.

LIMBER (D. P.). **The observed frequency of mature pycnidia of Septoria gladioli on Gladiolus corms.**—*Phytopathology*, xxxvii, 3, pp. 190–191, 1947.

Gladiolus corms in ten consignments (out of 150) from Holland, England, Australia, and Canada examined at the Bureau of Entomology and Plant Quarantine inspection house at Hoboken, New Jersey, between 14th January and 15th June, 1946, bore advanced hard-rot (*Septoria gladioli*) [*R.A.M.*, xxvi, p. 58] lesions on which the rare mature pycnidial stage of the fungus was present [ibid., v, p. 164; xix, p. 353]. The environmental conditions resultant on packing for transport may contribute to the development of pycnidia. Some of the affected lots, however, arrived in well-ventilated packages, so it seems probable that fruiting pycnidia are more common on gladiolus corms than has hitherto been supposed.

Plant Diseases. Diseases of Dahlias.—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 90–92, 5 figs., 1947.

Dahlias are subject to infection by several virus diseases, the two most important in New South Wales being spotted wilt caused by the tomato spotted wilt virus [*R.A.M.*, xxii, p. 279], which is almost universally present, and stunt [dahlia mosaic virus: ibid., xxvi, p. 32]. Powdery mildew (*Erysiphe cichoracearum*) and leaf spot (*Entyloma dahliae*) [ibid., xx, p. 119; xxvi, p. 32] also cause damage in some seasons. Notes are given on the symptoms and control of these diseases.

ZWARTENDIJK (J.). **Is de aantasting van Pestalozzia guepini op Rhododendron primair of secundair?** [Is the infection by *Pestalotia guepini* on *Rhododendron* primary or secondary?]—*Tijdschr. PlZiekt.*, liii, 2, p. 55, 1947.

The writer has observed that infection by *Pestalotia guepini* on *Rhododendron* [*R.A.M.*, xxii, p. 482] invariably occurs on foliage injured by various agencies. In a recent grafting experiment in the nursery of the Phytopathological Service at Boskoop, *Rhododendron* scions treated with ethylene chlorhydride were shortly afterwards attacked by the fungus, whereas the controls and those dipped in hot water remained free from infection. Thus, *P. guepini* evidently occurs in a secondary capacity, at any rate on cultivated shrubs, and every precaution should therefore be taken against damage to the leaves.

MCCLELLAN (W. D.). **Efficacy of certain soil fumigants and fertilizers against crown rot in annual Larkspur caused by Sclerotium rolfsii.**—*Phytopathology*, xxxvii, 3, pp. 198–200, 1947.

On 12th and 13th December, 1945, soil fumigants were applied to plots 18 by 9 ft. in a field in the Rio Grande Valley, Texas, where extensive losses among annual

larkspurs (*Delphinium ajacis*) had been caused for several years by *Sclerotium rolfsii* [*R.A.M.*, xxi, p. 138]. Seed of the Imperial Los Angeles variety was sown on 9th January and nitrogenous fertilizers were applied to non-fumigated plots on 30th January, 20th February, and 20th March, 1946. On 15th April the numbers of healthy plants were as follows: chloropicrin (28·7 gals. per acre), 237; carbon disulphide (102·2), 185; iscobrome No. 2, consisting of 60 per cent. xylol, 15 per cent. methyl bromide, and 25 per cent. chloropicrin (57·5), 199; ETN mixture (15 per cent. ethylene dibromide, 20 per cent. tetrachlorethane, and 65 per cent. naphtha thinner, at 51·1 gals per acre), 170; three side-dressings of ammonium sulphate (735 lb. per acre), ammonium nitrate (450), cyanamide (712·5), uramon (356·8 and 712·5), 144, 248, 155, 154, and 189, respectively; uramon (950) and ammonium nitrate (1,200) broadcast before planting, 18 and 19, respectively; and untreated, 115. Chloropicrin, carbon disulphide, iscobrome No. 2, and the ammonium nitrate and uramon (712·5 lb.) side-dressings resulted in statistically significant increases [cf. ibid., xxi, p. 399].

THOMAS (H. EARL) & BAKER (K. F.). **A rough-bark disease of Pittosporum tobira.**—*Phytopathology*, xxxvii, 3, pp. 192–194, 1 fig., 1947.

The most injurious effect of a disease of *Pittosporum tobira* of some years' standing in central and southern California is a necrosis and subsequent sloughing-off of the outer bark. The decay may extend sufficiently far into the bark to girdle and kill the branch, which in such cases bears only terminal clusters of a few small, rolled leaves. The shrubs are abnormally small and may gradually die. Foliar symptoms are of various types, of which the mildest consists of diffuse, chlorotic yellow to tan blotches, sometimes enclosing green islands; others are an oak-leaf or watermark pattern, especially along the midrib; small, angular, yellow areas suggestive of *Cercospora* [*pittospori*: *R.A.M.*, xx, p. 67]; and, more rarely, ring spots with concentric, yellow lines or moiré designs. *P. viridiflorum* and variegated *P. tobira* displayed similar symptoms but were not included in this study.

The disease is carried in cuttings but is not completely systemic, since less than half of those from affected plants developed symptoms while the active principle seems to be seldom or never transmitted through the seed. In inarch-grafting experiments with diseased scions of *P. tobira* with bark symptoms and *P. crassifolium*, with leaf symptoms only, on healthy *P. tobira* stocks gave positive results (on the leaves only in the latter case). Some indications of slow natural spread were observed in gardens at Berkeley. The connexion, if any, between this disease and the virus on *P. daphniphylloides* (*Mon. Bull. Calif. Dep. Agric.*, xxix, pp. 158–159, 1940) is not yet clear.

SARASOLA (A. A.). **Dos enfermedades semejantes causadas por Botrytis cinerea y Ovularia viciae en las Alverjillas forrajeras (Vicia spp.).** [Two similar diseases caused by *Botrytis cinerea* and *Ovularia viciae* in fodder Vetches (*Vicia* spp.).]—*Publ. tec. Dir. Agric., B. Aires*, iii, 3, 16 pp., 4 figs., 1946.

The material on which this comparative study was based consisted of vetch plants infected by *Botrytis cinerea* at La Estanzuela, Uruguay, and by *Ovularia viciae* in La Plata, Argentina. The spots produced on the leaves by the former species are reddish-brown, circular, oblong, or irregular, up to 3 (generally 0·5 to 1) mm. in diameter, while those on the stems, petioles, and tendrils measure 4 to 5 mm. The fungus causes partial defoliation and may entirely destroy the other organs. The lesions due to *O. viciae* on the leaflets are dark brown, 1 to 4 mm. in diameter, with a thickened margin, and covered with white dots, consisting of fascicles of hyaline, flexuous, simple, non- to triseptate conidiophores, 71·4 to 198·9 by 3·8 to 5·1 μ, and hyaline, spherical or subspherical, unicellular conidia, with a basal papilla 8·9 to 15·3 by 7·6 to 14 μ.

Positive results were given by inoculation with *B. cinerea* on *Vicia benghalensis*, *V. sativa*, *V. villosa*, broad bean, and *V. faba* var. *minor*, and with *O. viciae* on *V. benghalensis* and *V. villosa*.

The use of resistant varieties and crop rotation are advocated for the control of both pathogens. *V. sativa* showed a very high degree of resistance to *O. viciae*.

Roberts (Winifred O.). **Simplifications of the Roach method of diagnostic plant injection.**—*J. Pomol.*, xxii, 3–4, pp. 184–188, 1 pl., 3 figs., 1947.

The author describes two modifications of the Roach method of diagnostic injection for the detection of nutrient deficiencies in plants [*R.A.M.*, xxiv, p. 334]. In one, a short length of soft, white cotton thread impregnated with the test solution and then dried is drawn with a fine darning-needle through a leaf petiole or other tissue; the ends are cut on either side, leaving a short length in the plant. In the other, a pad of cotton-wool moistened with the solution is bound with adhesive tape over the wound caused by removing a leaf at the base of the petiole. The resulting distribution of the reagent in the plants tested (apple, pear, quince, and *Hydrangea*) was identical with that given by the Roach method. Trials are unaffected by wind, rain, or capillary creeping of the solution over hairy surfaces.

Kidson (E. B.). **Mineral deficiency of Apple leaves: distribution of magnesia, potash and lime in the leaves of young shoots.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 173–182, 1946.

An examination in December, 1940, of the mineral composition of the current season's leaves on Cox's Orange apple trees from three different localities in the Nelson district of New Zealand revealed variations in mineral content with position on the leader, and that where magnesium [*R.A.M.*, xxiii, p. 233] or potassium deficiencies occurred the element in low supply tended to be highest in the young leaves near the growing point when calculated as a percentage of the dry matter. The young growth had a uniformly lower calcium content than older leaves on the same shoot.

As the season advanced, trees lacking either magnesium or potassium showed a decrease in the total content per leaf of the deficient element in the lower leaves of the leader, the withdrawal probably being made in response to the requirements of the growing point of the shoot.

The appearance of magnesium-deficiency symptoms in Cox's Orange and Jonathan leaves was associated with a content of this element of less than 0·14 per cent. magnesium oxide, but could not be correlated with any particular percentage of the mineral in the leaf.

Folsom (D.). **Apple spraying with new fungicides.**—*Bull. Me agric. Exp. Sta.* 442, pp. 273–274, 1946.

The following five fungicides were tested for controlling apple scab [*Venturia inaequalis*: *R.A.M.*, xxv, p. 398]: dry lime-sulphur at 8 lb. per 100 gals. water; micronized sulphur at 10 lb. per 100 gals.; puratized N5–E at $\frac{1}{20}$ gal. to 100 gals. (active ingredient 1: 20,000); dithane D–14 at 1·5 qts. to 100 gals. (1: 667) plus $\frac{3}{4}$ lb. zinc sulphate and $\frac{1}{2}$ lb. hydrated spray lime; and isothan Q–15 at $\frac{1}{10}$ gal. to 100 gals. (1: 5,000). Dry lime-sulphur gave the best results in 1945; isothan Q–15, puratized N5–E, and micronized sulphur were of little use and dithane D–14 merely russeted the fruits and decreased their size.

Hutton (K. E.). **Trunk and limb cankers of coastal Apple tree caused by Dothiorella.**—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 92–94, 3 figs., 1947.

For some years a serious die-back of apple-trees [*R.A.M.*, xvii, p. 443; xix, p. 352] has caused loss to growers in the coastal regions of New South Wales. The

disease, caused by the fungus *Dothiorella* sp. [ibid., v, p. 279; xxiii, p. 253], shows three forms; (*a*) bark canker of limbs, (*b*) wood infection following pin-hole borer [*Scolytus* sp.] attack, and (*c*) trunk canker. The bark canker causes a leader and lateral die-back, especially in the Hills District. Brown lesions are formed which cause a spring collapse and the fungus, proceeding along the outer wood beyond the bark canker, produces black bands $\frac{1}{8}$ to $\frac{1}{4}$ in. wide. Then the bark canker turns from brown to black, the outer layer lifting and giving a ragged appearance. The small, black fruiting bodies appear four to five weeks after infection. The first sign of a wood infection following a borer attack is a brown colouring of the xylem tissue. The bark is blackened by a watery ooze from the tunnel entrance and a scurfy condition is sometimes found. The affected area has a papery appearance on drying. The fungus *Dothiorella* sp. can be isolated from brown to black streaks in the wood. There is a possibility that the borer is a vector of the *Dothiorella* and this is being investigated.

The trunk canker, which is very extensive on the McIntosh Red variety, occurs in the Oakdale district. Both the borer and a *Dothiorella* sp. are associated with this. The first sign, in mid-January, is a small, dark, wet area around the tunnel entrance. Dark streaks penetrate into the wood beyond the bark cankers. There is no control as yet for (*b*) and (*c*) but in the case of (*a*) diseased wood should be cut off to a distance of 18 in. to 2 ft. below the wood discoloration.

A serious die-back of apricot limbs accompanied by gumming occurs in the Richmond–Kurrojong area and the same association of borer and fungus has been found to be responsible.

THOMAS (H. EARL) & SCOTT (E. E.). **Arsenical injury, leaf spotting, and defoliation of Apple.**—*Mon. Bull. Calif. Dep. Agric.*, xxxvi, 1, pp. 37–38, 1 fig., 1947.

For the past 15 years there has been considerable spotting and defoliation of apple leaves in the Pajaro Valley of Santa Cruz. *Stemphylium congestum* [*R.A.M.*, x, p. 321; xxiv, p. 22] has been isolated frequently from spots. The authors conclude, however, after inoculation tests with *S. congestum* that the fungus causes only slight to moderate spotting and no defoliation and that arsenical sprays are the primary cause of both disorders, which are merely aggravated by *S. congestum*.

GOIDÀNICH (G.). **Un interessante tipo di butteratura parassitaria delle Mele.** [An interesting type of parasitic pitting of Apple.]—*R.C. Accad. Lincei*, Ser. VIII, i, 5, pp. 654–659, 3 figs., 1946.

In 1939, the author examined Calvilla Bianca apples from Verona affected by pitting. Small round spots were more or less regularly distributed over the surface, the tissue under them being brown and depressed. A fungus was isolated from affected material, inoculations with which into healthy apples gave positive results.

The pycnidia developed rapidly, emitting numerous hyaline, unicellular conidia, which, as they appeared, formed a mucous agglomeration round the ostiole. Other pycnidia arose from the chlamydospores [hypnocysts: *R.A.M.*, ix, p. 240 and below, p. 356]. These organs were usually multicellular, irregular in structure, mostly clavate, isolated or, more often, arranged in chains. The fungus is placed in the genus *Peyronellaea* recently erected by the author [loc. cit.] and is provisionally named *P. veronensis* n.sp.

MOORE (M. H.). **Bacterial canker and leaf spot of Plum and Cherry. A summary of present knowledge on control measures in Britain.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 57–62, 1947.

This paper has already been noticed from another source [*R.A.M.*, xxvi, p. 159].

TUZSON (J. v.). **Az Öszi barackfa Agaricus melleus okozta betegsége.** [On the Peach tree disease caused by *Agaricus melleus*.]—*Ann. hist.-nat. Mus. hung.*, Pars bot., xxxvi, pp. 132–136, 2 pl., 1943. [German summary. Received May, 1947.]

Agaricus melleus [*Armillaria mellea*] was found to be responsible for the dying-off of grafted peach trees [*R.A.M.*, xxiv, p. 25] observed annually in a large orchard at Érd, Hungary, on a recently cleared forest site where the fungus was already widespread and continued to thrive on the decaying roots, stumps, and other woody debris. Entry into the stems was gained through the juncture between scion and stock, which should preferably be located at a higher level to avoid any risk of contact with contaminated soil.

WEI (C. T.). **Notes on the storage and market diseases of fruits and vegetables. I. Market diseases of stone fruits.**—*Sinensia*, xii, 1–6, pp. 135–152, 11 figs., 1941. [Received March, 1947.]

Notes are given on diseases of stone fruits found in the Chengtu market in 1939–40. *Alternaria tenuis* was found as a weak wound parasite on fruits of peach, plum (*Prunus salicina*), and *P. mume* [Japanese apricot].

Aspergillus luchuensis [*R.A.M.*, xii, p. 397; xvii, p. 455] is described as having conidia spherical on peach, ovate to broadly oblong on *P. salicina* and *P. mume*, verrucose (peach), or coarsely echinulate (*P. salicina* and *P. mume*), measuring 3·2 to 4·5 μ in diameter in the peach strain, 4·2 to 7·7 by 3·9 to 5·6 μ in the *P. mume* strain, and 5·6 to 9·1 by 4·9 to 9·1 μ in the *P. salicina* strain. On ripe fruit of the honey-type peach (*P. persica*), the fungus caused a colonial, buff-coloured, soft but not watery rot, more or less round with a distinct and entire margin, developing rather rapidly. The disease was common and destructive. On *P. salicina* the affected area was Rood's brown, soft, Vandyke-brown at the distinct and entire margin, the rotten flesh being a deeper colour than the healthy; a white mould soon appeared, later turning black as the conidia formed. On *P. mume* the rot was clay-coloured to sayal-brown, very soft, circular with a distinct and entire margin, and very rapid; the infected flesh was clay-coloured. A white mycelial growth appeared at the centre and turned black, leaving a white, sterile margin, as the conidial heads developed. The fungus was common on fruit of *P. mume* and occasionally occurs on plum.

A. versicolor [ibid., xxiv, pp. 240, 381] attacked the ripe fruit of the honey-type peach, causing a light pinkish-cinnamon, soft, more or less round rot with a distinct and entire margin; the fructifications were olive-yellow, later zainette green. The rot was quite common on the ripe fruits, though less so than *A. niger*.

Botrytis cinerea caused heavy loss to apricot (*P. armeniaca* var. *ansu*) fruits, in one instance amounting to about 30 per cent., but less to peaches, though even with this host the loss in one case was over 10 per cent. Inoculations with the apricot strain infected peaches.

Cephalothecium [*Trichothecium*] *roseum* [cf. ibid., xxi, pp. 209, 531] caused up to 10 per cent. rot in very ripe, delicate fruits of honey-type peaches; the fungus is a weak parasite, and caused no rotting when inoculated into plums.

Cladosporium carpophilum [ibid., xxiv, p. 153] produced very numerous spots on single peaches, often with a pattern resembling that caused by raindrops running off, indicating that the spores were rain-borne. In nature the fungus also attacks apricot (var. *ansu*) and *P. mume* fruits. Infection was highest on peaches, over two-thirds of this fruit in the market being infected, in addition to those attacked in the orchard. Inoculations of wounded plums (*P. salicina*) gave positive results.

Gliocladium mumicola n.sp. caused rotting of *P. mume* fruits. In culture it produced a thin layer of white, downy fruiting structure, later snuff-brown, the reverse being cinnamon to clove brown. Aerial mycelium, at first lacking, was loose and sparse; the vegetative mycelium measured 2·8 to 4·2 μ in diameter, and the fertile mycelium, which was sometimes tinted with brown, 3 to 9·8 μ. The conidiophores, arising perpendicularly from cells of the fertile hyphae, were 67·2 to 382·4 by 6·2 to 12·9 μ; metulae of one to two series, or sometimes none, 11·2 to 28·5 by 2·4 to 7 μ. The sterigmata, which formed a verticil on the conidiophore or occurred in a group of two to several on a metula, measured 7 to 14 by 2 to 3 μ. The chlamydospores formed irregular balls of 4 to 12 cells, 46·2 to 61·2 by 3·9 to 5·7 μ; single cells, globose to subglobose or irregular as a result of crowding, thick-walled, contained numerous oil globules 12·6 to 29·4 μ across. On rotten fruit the elliptical to narrowly ovate or elongated-elliptic, hyaline, biguttulate conidia, arranged in chains, then forming a head with mucilaginous fluid, measured 5·6 to 14 by 2·8 to 5·6 μ. The species differs from *G. roseum* in the absence of a loose, floccose type of growth, its larger conidia, and the presence of chlamydospores.

Gloeosporium amygdalinum [ibid., xiv, p. 680] commonly produced rotting on ripe *P. mume* fruits.

G. serotinum attacked *P. armeniaca* var. *ansu*, peach, and *P. salicina*; cross-inoculations gave symptoms resembling those found in nature. The fungus is described as showing acervuli scattered over the diseased area, raised, pinkish on a very minute, blackish base, round to oblong, 81·9 to 207·9 μ in diameter, and without setae. The simple, rarely branched, hyaline conidiophores, in a palisade, measured 8·4 to 29·4 by 1·4 to 4·2 μ. The oblong, cylindrical, sometimes ovate, hyaline, continuous conidia showed a central refractive sphere and measured 7 to 16·8 by 2·8 to 6 μ.

Physalospora piricola [ibid., xv, p. 374] attacked *P. armeniaca* var. *ansu*, peach, and *P. salicina*. On cross-inoculation, all the strains produced rot typical of the host. The fungus is described as having innate, erumpent, conical to oblong pycnidia 359·6 to 713·4 μ in diameter by 429·2 to 823·6 μ high. It was never observed to mature on host tissue in the laboratory. On various media [the pycnidia] were up to 1 mm. or more in diameter. The simple, hyaline, continuous, rarely branched, filiform to subclavate, occasionally slightly geniculated conidiophores measured 12·6 to 40 by 2·5 by 4·9 μ. The hyaline, continuous, narrowly ovate or elliptic-fusiform conidia, sometimes cuneate at the base, measured 18·9 to 28 by 4·9 to 7 μ. In moist air or water they became up to 3-septate, produced one or two polar germ-tubes with occasional lateral ones, and often showed filiform, hyaline, aseptate paraphyses 14 to 44·8 by 2·5 to 4·9 μ.

Penicillium chloroleucon produced a soft, deep, olive-ochre to sayal-brown rot on plum, though not frequently on this host. Inoculations into honey-type peach gave a snuff-brown rot.

A species of *Phoma* caused rotting of damaged peaches. *Phomopsis amygdalina* [ibid., xv, p. 731] caused a soft, brown rot on apricots occasionally; on peaches it entered the fruit through the stem end, stylar end, or a wound, producing a dry, wrinkled effect and sometimes causing considerable loss (10 to 30 per cent. being not uncommon) among later varieties; on plum, the fungus was not important.

On ripe peaches, *Rhizopus nigricans* [*R. stolonifer*: ibid., xxiii, p. 234] caused a snuff-brown rot; if the affected fruit was not promptly removed the fungus sometimes destroyed entire lots, especially among the honey-type peach.

R. artocarpi [ibid., xxii, p. 53] (which the author considers to be only a variant of *R. stolonifer* on peaches) caused a rot similar to that produced by the latter. When inoculated into plum, a rot developed which covered four-fifths of the fruit in three days. *Sclerotinia laxa* caused rotting of apricot and peach, and (when inoculated experimentally) of plum.

KRONENBERG (HESTER G.). **Autoreferaat van de voordracht voor de Ned. Plantenziektenkundige Vereeniging op 28 Nov. 1942 te Amsterdam. Virusziekten in Aardbeien.** [Author's abstract of the lecture to the Dutch Phytopathological Society on 28th November, 1942, at Amsterdam. Virus diseases in Strawberries.]—*Tijdschr. PlZiekt.*, xlix, 2, pp. 74–76, 1943. [Received November, 1946.]

Brief descriptions are given of three virus diseases of strawberries in Holland, the symptoms of which correspond with those of yellow edge, crinkle, and witches' broom. The results of preliminary transmission experiments, using R. V. Harris's stolon-grafting method [*R.A.M.*, xii, p. 519], left no doubt as to the presence in the country of the crinkle virus, which was harboured by the three strawberry varieties included in the tests, viz., Jucunda, Oberschlesien, and Frau Mieze Schindler. An objection to the use of the wild strawberry (*Fragaria vesca*) as an indicator plant is its strong reaction to the crinkle virus, which tends to inhibit the expression of other virus symptoms: it should be supplemented in future trials by a somewhat less susceptible variety, such as Deutsch Evern. Symptoms of yellow edge are conspicuous in the Deutsch Evern variety and sporadic cases of witches' broom occur regularly.

CISNEROS (R. S.). **El tizón de la Frutilla en la República Argentina.** [Strawberry blight in the Argentine Republic.]—*Publ. tec. Dir. Agric., B. Aires*, iii, 4, 16 pp., 1 pl., 2 figs., 1946.

The presence of the strawberry leaf blight caused by *Dendrophoma obscurans* [*R.A.M.*, iv, p. 335; xxiv, p. 423, *et passim*] was first recognized in Argentina (Province of Buenos Aires) in 1944. The symptomatology and morphological and cultural characters of the fungus are described and directions are given for its control based on experience in the United States; the geographical distribution of the disease in the latter country is indicated. *D. obscurans* was readily isolated in pure culture on standard media, of which rolled oats and 2 per cent. dextrose agar were the best, the spores germinating in 2 to 7 days at 25° C. The incubation period of the pathogen in the author's experiments was 20 days as against ten reported by other workers, the discrepancy being presumably due to differing environmental conditions.

MCDONALD (J. E.) & FUDGE (J. F.). **Commercial insecticides and fungicides in Texas 1945–1946.**—*Circ. agric. Coll. Tex.* 112, 13 pp. 1946.

This is the fourth annual report [cf. *R.A.M.*, xxv, p. 351] required by the Texas Insecticide and Fungicide Law setting forth colouring, branding, and labelling requirements, and analyses of 61 agricultural insecticides and fungicides made during the year.

MCCALLAN (S. E. A.). **Dithiocarbamate fungicides.**—*Agric. Chemicals*, i, 7, pp. 15–18, 55, 2 figs., 1946.

In this paper the author presents a succinct account of the present state of knowledge concerning the physical, chemical, and fungicidal properties of the group of organic materials derived from dithiocarbamic acid: tetramethylthiurum disulphide, known as thiosan, tersan, arasan, nomersan, and T.M.T.D.; ferric dimethyl dithiocarbamate, known as fermate; zinc dimethyl dithiocarbamate, known as methasan, zerlate, or milban; and disodium ethylene bisdithiocarbamate, known as dithane.

In the control of the turf diseases brown patch [*Corticium solani*] and dollar spot [*Sclerotinia homoeocarpa*] the wettable form, thiosan, has given results comparable with those secured from the organic mercury treatments [*R.A.M.*, xxiv, p. 105].

The same material in dust form (arasan) is used to increase the stand of groundnuts [ibid., xxiv, p. 269; xxv, p. 332]. This dust has been proved to have an important place in vegetable seed treatments [ibid., xxv, p. 379]. For the general control of seed decay and damping-off, arasan is probably the best seed treatment for beet [ibid., xxiv, p. 405], sweet corn [maize], and tomato, and among the best for carrot, cucumber [ibid., xxiii, p. 508] and *Cucurbita* spp., spinach [ibid., xxv, p. 591], and Swiss chard [*Beta vulgaris* var. *cicla*]. It is also good on cabbage and other cruciferous seed. On onion seed arasan plus sticker has given damping-off control equal to that of standard formaldehyde solution, in addition to being much less laborious.

With legume seeds arasan gives control about equal to that of the organic mercury fungicides, but it is generally surpassed by spergon. A striking advantage of arasan is that it is less injurious to seed than the organic mercury treatments and the treated seed can be stored for long periods without injury from the chemical. Limited trials with maize indicate that arasan and spergon may equal the standard organic mercury treatments [ibid., xxv, pp. 391, 556].

As an apple spray [ibid., xxv, pp. 384, 402; xxvi, p. 97] fermate has proved very effective and is compatible with lead arsenate, lime, summer oils, and DDT. It appears to reduce the tendency of lead arsenate to cause russeting. Fermate controls scab [*Venturia inaequalis*: loc. cit.] fairly well, though surpassed in this respect by the new phenylmercurictriethanol ammonium lactate [ibid., xxvi, p. 67] fungicides. It is outstanding against rust [*Gymnosporangium juniperi-virginianae*: ibid., xxiv, p. 265; xxv, p. 402], and has controlled blotch [*Phyllosticta solitaria*], bitter rot [*Glomerella cingulata*], and frog-eye leaf spot [*Physalospora obtusa*; see above, p. 333] as well as, or better than, Bordeaux mixture. An objectionable feature of fermate, however, is its black residue. Fermate has also controlled pear scab [*V. pirina*: ibid., xxv, p. 69] on sulphur-sensitive varieties without causing fruit-russeting. Against cranberry fruit rots [*G. cingulata* var. *vaccinii* and other fungi: ibid., xxv, p. 171], fermate has given much better control than Bordeaux mixture. It also controls carnation rust [*Uromyces caryophyllinus*: ibid., xxiii, p. 236].

In general, it appears that dithane plus zinc sulphate and lime is superior to the fixed copper fungicides and to the other new organic preparations used against late and early blights of potato [*Phytophthora infestans* and *Alternaria solani*, respectively: ibid., xxiv, p. 69; xxv, p. 415], though Bordeaux mixture is as good or better against *P. infestans*. Against both diseases, zerlate is superior to fermate [ibid., xxvi, p. 166]. Dithane plus zinc sulphate and lime and the zinc dimethyl dithiocarbamate control tomato early blight [*A. solani*], while zerlate, dithane plus zinc sulphur-lime, and fermate control celery blights [*Cercospora apii* and *Septoria apii*: ibid., xxiv, p. 262] at least as effectively as the best copper sprays. The control of tobacco blue mould [*Peronospora tabacina*: ibid., xxv, pp. 237; xxvi, p. 134] has been much simplified by the use of fermate.

French (O. C.). **New equipment for agricultural pest control.**—*Agric. Chemicals*, i, 8, pp. 15–19, 51, 13 figs., 1946.

Brief descriptions are given of some types of equipment now in use in the United States for the control of agricultural pests. Before the war, increased use was being made of mobile sprayers, the operators riding on platforms or in elevated towers. This method reduced the number of men required and accelerated the spraying operations. During the war, the shortage of labour impelled many operators to build automatic vertical booms for their large sprayers [cf. *R.A.M.*, xxv, p. 71], the demand for this type of equipment coming particularly from walnut- and citrus-growers. At present there is no standard design for these booms.

The use of concentrated liquid sprayers employing a large-volume air stream

for atomizing and conveying the spray has greatly increased recently. For tree crops, the equipment usually consists of a blower which discharges 8,000 to 10,000 cu. ft. of air per min. through a fish-tail nozzle at 120 to 150 m.p.h. Liquid is introduced by nozzles or orifices in a small tube along the length of the fish-tail at its outlet. The spray material is concentrated so that 10 to 30 gals. per acre applied to trees of normal size is comparable to 3 to 6 gals. per tree of standard dilute sprays. The advantages of this type of sprayer are that it is lighter than the standard sprayer, less time is lost in refilling, only one operator is required, and the machine can also be used for dusting. It is used by some growers for the complete spray schedule on almonds, apricots, peaches, and plums, and, to a limited extent, on pears; similar equipment has been used on vines for many years.

Speed sprayers [ibid., xxv, p. 254] now provide for the air blast to be directed outwards at 90° from the fan shaft axis and throughout 240° of a circle. There is no provision for altering the direction of the air stream. One Californian grower who has used speed sprayers for the past two seasons claims that his total spraying costs are less than half of what they were when he used high-pressure sprayers with hand-operated nozzles. Each machine can spray at the rate of 2,500 gals. per hour over a ten-hour day. The demand for aeroplane spraying is increasing.

Dusting equipment is also undergoing re-design. As dusters increase in number and size, growers are faced with the difficulty of confining poisonous dusts to the crops being treated. This problem is causing research workers to pay more attention to concentrated liquid sprays and combination dusters which apply a finely atomized liquid simultaneously with the dust in order to prevent drifting and to increase the dust deposit on the plant surfaces. Dusters, like sprayers, should be 'one man'-operated if possible. In general, this requirement has been met except for machines dusting very large trees, for which two operators are usually required in addition to a driver.

Vineyard dusting now demands equipment to handle several materials besides sulphur. A large-volume, low-velocity type fan, similar to the citrus duster, but smaller, has been developed to meet this need. These machines are mounted on a chassis with reduced wheelbase and tread in order to pass between the rows without injuring the vines. Truck crop dusters should be integrally mounted on a tractor unit, trailed equipment being too unwieldy.

Marchionatto (J. B.). **La micología en la República Argentina.** [Mycology in the Argentine Republic.]—*An. Soc. cient. argent.*, cxliii, 1, pp. 14–20, 1 fig., 1947.

The commemoration of the 75th anniversary of the foundation of the Argentine Scientific Society prompted this epitome of outstanding landmarks in the history of mycology in the Republic [cf. *R.A.M.*, xxv, p. 403], beginning with the discovery by Commerson in 1767 of the valuable edible fungus, *Cyttaria darwini* [ibid., xxi, p. 507]. During the nineteenth century several important mycological collections were made in the course of scientific expeditions to the Antarctic, and in 1881 Spegazzini paid his first visit to Tierra del Fuego and inaugurated his long series of contributions, covering nearly half a century, to the knowledge of fungi, not only in Argentina but in the South American continent as a whole. In 1879, when Spegazzini arrived in Argentina, a bare 39 fungi had been recognized in the country, while to-day the number of known species exceeds 5,000. Among others devoting themselves to the study of various groups of Argentine fungi may be mentioned Thaxter (Laboulbeniales, 1906), and Hennings (1894), Dietel and Neger (1899), Arthur (1925), and Jackson (1926–32), all concerned with the Uredinales, while various aspects of mycology are still engaging the attention of contemporary workers.

The repercussions of the mycological studies on other sciences in Argentina are briefly discussed.

STAKMAN (E. C.). **International problems in plant disease control.**—*Proc. Amer. phil. Soc.*, xci, 1, pp. 95–111, 8 figs., 3 graphs, 6 maps, 1947.

In this paper, read at Philadelphia on 22nd October, 1946, in the symposium of the National Academy of Sciences on present trends and international implications of science, the author pleads for international co-operation in the control of plant diseases, with special reference to stem [black] rust of cereals (*Puccinia graminis*). Other diseases of major importance for which similar treatment is claimed include chestnut blight (*Endothia parasitica*), potato blight (*Phytophthora infestans*), the vine powdery and downy mildews (*Uncinula necator* and *Plasmopara viticola*), downy mildew of hops (*Pseudoperonospora humuli*), flax rust (*Melampsora lini*), wheat bunt (*Tilletia tritici*) [*T. caries*], and many others. Most of the papers listed in the bibliography of 56 titles have been noticed from time to time in this *Review*.

SNEEP (J.). **De biochemie van parasitisme.** [The biochemistry of parasitism.]—*Tijdschr. PlZiekt.*, lii, 5–6, pp. 125–137, 1 pl., 1946. [English summary.]

Neither *Nematospora phaseoli* [*R.A.M.*, xxiii, p. 207] nor *Phycomyces blakesleeanus* [cf. ibid., xxv, p. 518] made any growth in a nutrient solution devoid of 'ergones' (the term used by Von Euler for 'growth substances' in 'Ergebnisse der Vitamin- und Hormonforschung', i, pp. 159–190, 1938). However, when the two organisms were transferred jointly to a similar medium, both grew and *P. blakesleeanus* formed sporangiophores. The latter utilizes the vitamin B_1 synthesized by *N. phaseoli*, which in its turn assimilates the biotin furnished by *P. blakesleeanus*.

As a working hypothesis to explain various types and manifestations of parasitism, e.g., biotrophic and perthotrophic parasitism, specialization of pathogens, hypertrophic development of parasitized tissues, and virus development in plants, it is assumed that the metabolic system of the host plant is complete and that of the biotrophic parasite incomplete, the latter being supplemented by growth substances derived from the host. Conversely, the metabolic system of the host is influenced by the pathogen.

BRIAN (P. W.). **Production of gliotoxin by Penicillium terlikowskii Zal.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 211–218, 1946.

Studies are described on strains of *Penicillium* isolated from Wareham Heath soil [*R.A.M.*, xxvi, p. 117 and cf. next abstract], which were found to produce gliotoxin [ibid., xxv, p. 571]. Some of the strains were at first identified as *P. jenseni* [ibid., xxiv, p. 333], but two of them have now been tentatively identified by Dr. K. B. Raper, of the United States Department of Agriculture, as *P. terlikowskii*, to which the fungus previously named *P. jenseni* is accordingly referred in this paper.

Assays of fungistatic activity were made by a serial dilution spore germination test on conidia of *Botrytis allii*. Culture filtrates from Raulin-Thom and Weindling media displayed greater fungistatic activity than those from Czapek-Dox or a maize steep medium. With the Weindling medium it was found possible to use a wide variety of carbon sources, while ammonium, peptone, and nitrate nitrogen were suitable as nitrogen sources. The initial pH value of the medium should be over 4. An unidentified impurity in a crude grade of glucose used in certain media increased sporulation and stimulated greatly the development of fungistatic activity in the culture filtrates. This result was not, apparently, associated with various minor elements, calcium, various vitamins, peptone, or yeast extract. The strains showed much variation in their ability to produce gliotoxin, one common sterile variant producing little, if any. It was apparent that the purely mycelial forms are worthless for gliotoxin production, while the conidial forms are outstandingly superior in this respect.

McGowan (J. C.). **The chemistry of fungal antibiotics in relation to soil microbiology.**—*Chem. & Indust., 1947*, 16, pp. 205–207, 1947.

This is a brief discussion of 39 contributions to the literature on the chemistry of fungal antibiotics in relation to soil microbiology, with special reference to the Wareham Heath mycorrhizal problem [cf. preceding abstract.]

Wikén (T.) & Öblom (Karin). **Examination of extracts from sporophores of Swedish Hymenomycetes for antibiotic activity against Staphylococcus aureus.**—Reprinted from *Ark. Bot.*, xxxiii A, 11, 14 pp., 1946.

The sporophore extracts of 24 out of 57 Swedish Hymenomycetes contained antibiotic principles effective against *Staphylococcus aureus* [*R.A.M.*, xxv, p. 519], and of these 11 gave measurable zones of growth inhibition outside the cylinders of the assay plates, namely, *Cantharellus tubaeformis, Clitocybe clavipes, C. inversa, Cortinarius turmalis, Craterellus lutescens, Flammula penetrans, Hydnum repandum, Lactarius repraesentaneus, Omphalia maura, Russula sardonia*, and *Tricholoma saponaceum*. The antibiotic activity of the extracts from *F. penetrans* withstood 15 minutes' autoclaving at a pressure of 1 kg. per c.c., corresponding to a temperature of 120° C., but that of the other ten species listed above was more or less reduced by the treatment.

Hayes (L. E.). **Survey of higher plants for presence of antibacterial substances.**—*Bot. Gaz.*, cviii, 3, pp. 409–414, 1947.

Of 231 species of higher plants of which the aqueous extracts were tested for inhibitory activity towards *Staphylococcus aureus, Escherichia* [*Bacterium*] *coli, Erwinia carotovora*, and *Phytomonas* [*Bact.*] *tumefaciens*, 18 proved to be of some interest in this respect. For instance, the growth of *E. carotovora* was markedly suppressed (inhibitory zone of 16 to 25 mm.) by extracts of *Allium tricoccum* leaves, *Convolvulus arvensis* leaves, stems, and roots, and *Taxus canadensis* fruits (including fruits boiled for five minutes). The inhibitory zones formed in *E. carotovora* cultures as a result of contact with the extracts of *A. vineale* leaves, *Ilex decidua* fruits, and *Ranunculus abortivus* (except the roots) measured 11 to 15 mm., and slighter antagonistic effects were exerted by a number of others. In the case of *Bact. tumefaciens, A. tricoccum* leaves and *A. vineale* bulbs produced inhibitory zones of 16 to 25 mm., while *A. cernuum* and *A. vineale* leaves fell into the next category of 11 to 15, and the third (6 to 10 mm.) was occupied by *A. cernuum* bulbs, *Barbarea vulgaris* winter rosette, *C. arvensis* roots, and entire plants of *Lepidium draba*.

Lucas (E. H.), Lewis (R. W.), & Sell (H. M.). **An antibiotic principle derived from seeds of Brassica oleracea.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxix, 1, pp. 4–6, 1946.

In the course of exploratory studies of plant materials, a principle antagonistic to a number of bacteria, including *Phytomonas* [*Xanthomonas*] *phaseoli*, and the fungi, *Fusarium* [*bulbigenum* var.] *lycopersici, Alternaria solani, Penicillium expansum*, and *Sclerotinia fructicola*, was detected in cabbage seed extracts [see preceding abstract].

Rigot (N.). **Étude des symptomes de l'enroulement primaire : influence de la fumure sur leurs manifestations. Transmission de la maladie.** [Study of the symptoms of primary leaf roll; influence of manure on their manifestation. Transmission of the disease.]—*Parasitica*, ii, 4, pp. 139–140, 1946.

This study of the appearance of primary leaf roll due to potato leaf roll virus [*R.A.M.*, xxiv, p. 471] in the progeny of infected plants was made at Orgéo, Belgium, by means of microscopic examination of the stems. Manure rich in nitrogen tended

to hide the symptoms of primary leaf roll, but those containing phosphorus and potassium accentuated them. The virus is transmitted quite regularly to the progeny and it is only in cases of slight infection among certain varieties that the symptoms cannot be detected immediately and these plants invariably show secondary leaf roll.

ROZENDAAL (A.). **Virusziekten van Aardappelplanten.** [Virus diseases of Potato plants.]—*Landbouwk. Tijdschr.*, lviii, pp. 533–543, 1946.

Following an outline of the history of potato viruses and of the methods adopted by various workers for their classification, the writer summarizes the present status of these pathogens in Holland, where two groups may be distinguished for practical purposes, namely, I, the leaf roll virus, and II, comprising A (corresponding to Quanjer's common mosaic virus), X (Quanjer's top-necrosis virus), Y (not absolutely identical with acropetal necrosis [*R.A.M.*, x, p. 746] but in all probability closely related to it), and F and G [potato aucuba mosaic virus] (Quanjer's aucuba mosaic).

ANDRÉN (F.). **Besprutningsförsök mot Potatisbladmögel 1946.** [Spraying experiments against Potato late blight in 1946.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 5, pp. 73–78, 1946.

During the summer of 1946, when potato late blight [*Phytophthora infestans*] was rife throughout Sweden, the following fungicidal sprays were tested against the disease [*R.A.M.*, xxv, p. 574] on the Magnum Bonum variety: ordinary 2 per cent. Bordeaux mixture; 2 per cent. Bordeaux prepared with kronkalk special (a calcium hydroxide manufactured by A. B. Karta Oaxen); the copper oxychlorides, cuzol (2 per cent.), kopsit (1 per cent.), soltosan (0·5 per cent.), viricuivre (0·5 per cent.), and usit (1·5 per cent.); the copper oxides, Sandoz (0·4 per cent.), Maag (0·5 per cent.), and perenox (0·5 per cent.); and dithane (in one series only). In two tests in one locality the incidence of blight, assessed by the usual 10-grade scale, in the treated plots on 25th September, ranged from 0·2 for the two brands of Bordeaux to 4·3 for usit and 6·9 for dithane, the figure for the unsprayed plot being 9·5. The average yields in the plots treated with Bordeaux, copper oxychloride, and copper oxide were 200, 184, and 173 dt [= 100 kg.] per ha., respectively, compared with 154 in the untreated. In another two tests in a different locality on 12th September the minimum percentage of infection (1·2) was in the plot sprayed with Bordeaux kronkalk and the maximum of 2·5 in the two treated with usit and cuzol, the control figure being 6·5. Plots treated with Bordeaux, copper oxychloride, and copper oxide yielded 168, 185, and 165 dt. per ha., respectively, compared with 160 for the untreated.

In a parallel experiment, in which the copper contents (reckoned as metal) of the copper oxychlorides and copper oxides were equalized with that of Bordeaux mixture, the incidence of blight on 25th September in no case exceeded 0·6, and the preparations represented in both these groups must be regarded as completely reliable for the control of the disease if properly applied. The yields in the Bordeaux-, copper oxychloride-, and copper oxide-treated plots were 150, 157, and 140 dt. per ha., respectively, as against 119 in the unsprayed.

ROLAND (G.). **La sensibilité de diverses variétés de Pomme de Terre à l'attaque de Phytophthora infestans (Mont.) de Bary.** [The susceptibility of different varieties of Potato to attack by *Phytophthora infestans* (Mont.) de Bary.—*Parasitica*, ii, 4, pp. 121–123, 1946.

During potato variety trials in 1946 in the region of Gembloux, Belgium, where a severe attack of *Phytophthora infestans* occurred [*R.A.M.*, xxv, p. 137], only one variety, Aquila, was resistant; Ackersegen and Prisca were slightly susceptible;

the other varieties inspected are classified according to their susceptibility. The results agree with those of other workers in Holland and Germany except for the Libertas and Noordeling varieties, which appear to be more resistant in Holland than in Belgium. The agreement in varietal susceptibility in Belgium, Holland, and Germany indicates that the virulence of *P. infestans* is almost equal in these countries.

Holmberg (C.). **Potatiskräften och Potatisål i Sverige år 1946.** [Potato wart and Potato eelworm in Sweden in the year 1946.]—*Växtskyddsnotiser, Växtskydds-anst., Stockh., 1947*, 1, pp. 5–9, 1 fig., 1 map, 1947.

During 1946, 180 fresh cases of potato wart [*Synchytrium endobioticum*] were recorded for the whole of Sweden [cf. *R.A.M.*, xxv, p. 521], the maximum for the past ten years. In 27 out of the 61 affected parishes the disease was observed for the first time. As in previous years, the fungus was most prevalent in the southern part of the country, notably in the vicinity of Kristianstad, where 222 new foci of infection were noted during the past five years, as against only 105 from 1928 to 1941, bringing the total at the end of 1946 to 327. Similarly in the Malmöhus district, where only 13 cases were reported between 1928 and 1941, the total by the end of 1946 had reached 72. Further experiments to determine the longevity of the pathogen in the soil [loc. cit.] pointed to an average of 15 years even under favourable conditions for the host, i.e., presupposing the annual intensive cultivation of immune varieties on the infested ground: otherwise a considerably longer period must be allowed.

Smith (M. A.) & Ramsey (G. B.). **Bacterial lenticel infection of early Potatoes.**—*Phytopathology*, xxxvii, 4, pp. 225–242, 2 figs., 1947.

Bacteria were isolated from the discoloured rotting lenticels of potato tubers arriving at the Chicago Produce Terminal from the principal States growing early crops, and compared with each other and with organisms emanating from the soil round the tubers and from the various types of soft rot following wounds or heat injury (scald) commonly affecting market potatoes. The lenticel bacteria were shown to resemble the agent of soft rot (*Erwinia carotovora*) [*R.A.M.*, xxvi, p. 124] and to be equally pathogenic.

Wound inoculations with cultures of lenticel bacteria resulted in the development of decay under the same conditions as favour soft rot by *E. carotovora*. Lenticel infections were readily obtained in freshly harvested tubers by immersion for a minute or longer in aqueous suspensions of bacteria from the same organs. Under controlled temperature and humidity conditions artificial inoculations did not cause lenticel decay at 61° or 72° F. at a relative humidity below 94·8 per cent., but at and above 98·2 per cent. infection occurred at both temperatures, being more rapid at the higher one.

The histological examination of naturally and artificially infected lenticels in various stages of decay disclosed suberized parenchyma cells in the infected area. Beneath this a new periderm layer, similar to that following mechanical injuries, was formed under the lesions in which the rotting was stationary.

A study of 66 bacterial isolates from lenticels, soil, and various kinds of soft-rot lesions revealed no morphological differences between them and only minor disparities in their biochemical and physiological characters. The pathogenic isolates are regarded as strains of *E. carotovora*.

Tyner (L. E.). **Studies on ring-rot of Potatoes caused by Corynebacterium sepedonicum.**—*Sci. Agric.*, pp. 81–85, 1947.

The author states that efforts to control bacterial ring rot of potatoes are concerned mainly with the prevention of the viable cells of *Corynebacterium sepedoni-*

cum [*R.A.M.*, xxvi, p. 211] from coming in contact with the seed pieces before planting. It is suspected that plants are sometimes infected while growing, either by way of the roots or by insect transmission to the vines. Regarding the latter means Kreutzer and McLean [ibid., xxii, p. 404] found that the spread of the bacteria in the plants is too slow for transference by insects to be effective in promoting the disease. Investigations were made, therefore, into the possibility of spread by means of the root system and by other methods.

Young plants after 20 days' growth in sand were washed out, the sets removed, transplanted to pots containing an aqueous nutrient solution for 20 days, and finally planted out in the field after the roots had been dipped in a suspension of *C. sepedonicum*. There were four series, (1) root tips only dipped, (2) root tips wounded and dipped, (3) the lower two-thirds of the root system dipped, (4) non-treated controls; there were 20 plants in each treatment. At digging time eleven of the first set were diseased, eight were healthy, and one dead; of the second eleven were diseased, two healthy, and seven dead; of those with wounded roots, 18 were diseased and one dead, and all 20 untreated plants were healthy. Therefore, it appears that potato plants are readily infected by *C. sepedonicum* through the roots, wounding of the roots increasing their susceptibility.

No infection resulted in potatoes planted in spring in contact with overwintered ring rot-infested plant material or soil [cf. ibid., xxiii, p. 119]. The roots of five rows of potato plants of which one row was planted with diseased sets were exposed by means of ditches to irrigation water in August. All tubers from the infected plants had developed the disease by late September but no infection was present on the healthy plants.

In September, 1943, two strips of iron comparable to the blade of a large cutting knife were contaminated by passing through ring rot tubers. In May, 1944, after storage in an unheated shed one was used to cut 20 healthy tubers before planting. In May, 1945, 25 sets were cut with the other infected strip. Of the 1944 plants two became infected; the 1945 plants were all healthy.

Sterilized pieces, 1 ft. sq., of a jute sack were treated with 1 ml. of an aqueous suspension of *C. sepedonicum* in flasks which were kept at various temperatures (47° to 68° C.) and for various times (2 to 16 hours). The pieces were then soaked for two hours in 100 ml. sterile water, and samples tested on a suitable liquid medium. It was found that bacteria were present in the unheated but had evidently been killed on the heated pieces. Jute sacking with marked areas which had been soaked in a suspension of *C. sepedonicum* was heated at 50° for $3\frac{1}{2}$ to 5 hours. The areas were tested by rubbing freshly cut sets of Carter's Early Favourite potatoes over the surface and observing infection development in the plants from them. The results confirmed the conclusion of the previous experiment that the bacteria are killed by heating.

JONES (J. O.). **Field methods for the diagnosis of mineral deficiencies in crop plants.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 18–22, 1947.

A brief, popular account is given of field methods for the diagnosis of mineral deficiencies in crop plants, including visual methods, the use of indicator plants, foliage spraying, injection, and the tissue test method [*R.A.M.*, xxiv, p. 287; xxv, p. 576].

WALLACE (T.). **Mineral deficiencies in fruit and vegetable crops.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 3–9, 1947.

After referring to the history of the study of mineral deficiencies in plants [*R.A.M.*, xxvi, p. 125], the author lists the mineral elements concerned and shows in what respects deficiency in them affects different crops. Mention is also made of methods of diagnosis and control, and there is a list of 11 references.

Plant (W.). **A survey of trace elements and magnesium deficiencies of crops in some counties of England.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 23–26, 1947.

After giving a brief report of the occurrence of trace element deficiencies observed in crops from 1942 to 1945 in certain parts of England, the author concludes that climate affects the incidence of boron and manganese deficiency; rainfall is not, apparently, the predisposing cause of seasonal variations, but droughts at critical periods in the growth of a crop probably induce conditions that may lead to shortages. Manganese deficiency is also more pronounced where field drainage is poor. Certain classes of soils develop manganese and boron deficiency when unsuitably managed or too heavily limed. Glasshouse soils are liable to show magnesium deficiency for this reason.

Stevenson (E. C.). **The effect of seedling diseases of Castor Beans on the subsequent plant development and yield.**—*Phytopathology*, xxxvii, 3, pp. 184–188, 2 figs., 1947.

At the Plant Industry Station, Beltsville, Maryland, seedling infections by *Alternaria ricini* [*R.A.M.*, xxiv, p. 386], *Fusarium* spp., and various Mucorales, responsible primarily for damage to the cotyledons of castor-bean [*Ricinus communis*] plants exerted a very deleterious action on subsequent growth and yield even in cases of recovery. The height and general vigour of the diseased seedlings were reduced and their maturity retarded, these effects being reflected, during the two years (1943–4) covered by the investigation, in a serious decline in yield, which amounted (in an average of four replications and combining the three varieties, Conner, Kentucky 38, and Doughty 11) to 870 lb. per acre compared with 1,098 in the healthy control plots. The quality of the seed, on the other hand, did not seem to be impaired by the diseases, no significant reductions having been recorded either in the hulling percentage or bushel weight.

Asthana (R. P.) & Mahmud (K. A.). **Cercospora leaf-spot on Piper longum Linn.**—*Mag. agric. Coll. Nagpur*, xxi, 3–4, pp. 58–59, 1947.

From October, 1945 to March, 1946, leaf spots (*Cercospora* sp.) caused considerable damage at Nagpur on long pepper (*Piper longum*). Yellow specks appeared on the upper surface of the leaves and rapidly changed to round, chocolate-coloured spots from 5 mm. to 1 cm. in diameter. After six or seven days these turned whitish-grey in colour and developed a yellow ring around them which eventually spread to cover the whole leaf. The disease occurs most frequently in damp and shady localities. The host cells are invaded by fine hyphae, developing into typically branched haustoria, from the hyaline to brown mycelium. Subhyaline to yellowish-brown conidiophores, having one or more geniculations near the apex, emerge singly or in clusters from small stromatic cushions, are usually non-septate or occasionally 1- to 3-septate near the base, and measure 2·09 to 5·59 (3·18) by 12·72 to 47·7 (21·62) μ. The straight or slightly curved conidia are mostly hyaline, pale yellow to olivaceous, obclavate to cylindrical, usually 3- to 4- (range 1- to 8-) septate, and measure 25·44 to 76·32 (50·88) by 0·95 to 3·49 (2·16) μ. They germinate readily in tap-water, putting forth one or more germ-tubes mostly from the apical cells. Inoculations of host leaves with conidial suspensions produced infection within 4 to 10 days, the germ-tubes entering through the stomata. Other inoculations using four varieties of *P. betle* and several *Cercospora* hosts were all negative. *P. longum* was inoculated with several *C.* spp. also with negative results. It is believed that this disease has not hitherto been reported on *P. longum* and the causal organism differs from other *C.* spp. in having typically branched haustoria. It is named *Cercospora piperata* n.sp. [without a Latin diagnosis] and is being investigated further.

THIRUMALACHAR (M. J.). **A cytological study on Uromyces aloës.**—*Bot. Gaz.*, cviii, 2, pp. 245–254, 25 figs., 1946.

The author's cytological study of *Uromyces aloës* [*R.A.M.*, xix, p. 542] which occurs on *Aloë vera* and *A. spicata* in India was carried out on material of the former species from Mysore in continuation of Ajrekar and Tonapy's investigations, on the morphological and cultural characters of the rust (*J. Indian bot. Soc.*, iii, pp. 267–269, 1923). The subepidermal pycnidia and teleutosori (the former often abortive) are produced on the leaves. The teleutospores germinate freely, giving rise to bi-, occasionally tricellular promycelia, the bi- or trinucleate, fertile terminal cell of which extrudes an infection hypha for the penetration of the host, thereby fulfilling the function of the apparently absent basidiospores. The haploid chromosome number, determined in the course of the meiotic divisions of the fusion nucleus in the promycelium, is six.

SLOOFF (W. C.), THUNG (T. H.), & REITSMA (J.). **Leaf diseases of Sereh (Andropogon nardus L.). 1. Banded sclerotial disease, caused by Rhizoctonia grisea (Stevens) Matz.**—*Chron. Natur.*, ciii, 1–2, pp. 6–9, 3 figs., 1947.

Andropogon nardus plants near Buitenzorg, Java, sustained severe damage from a leaf blight characterized by the development over half or the whole of the lamina of transverse, straw-coloured bands of necrotic tissue, separated in acute cases only by narrow, irregular, purplish-grey zones, the most striking symptom of the disease. The discrete blotches appearing on the leaves in milder forms of infection may coalesce and leave green islands of variable shape. The newly invaded tissues are dirty green, slightly water-soaked, separated from the dead areas by a narrow, orange margin and from the healthy ones by a thin, irregular, dark green zone. A silky mycelium arises from the necrotic tissues and spreads over the healthy portions of the lamina. Primary infection may originate on any part of the leaf, but has most commonly been observed in the centre. Under humid conditions it expands rapidly, passing from one leaf to another but sparing the stalks. When the entire width of the leaf is covered, including the main vein, the water supply to the apical region becomes disorganized, resulting in the desiccation and curling-up of the blade.

On Thaxter's agar the feathery, profusely branching, and anastomosing mycelium, composed of hyphae 7 to 8·4 μ in diameter, gradually turns faintly violet-brown except for the fluffy, white, later grey or buff to brown clumps giving rise to the velvety sclerotia, which develop within a week at 25° to 30° C., measure 1·2 to 2·8 mm. in diameter or 5 by 2 mm. when coalescent, and on sectioning display a typical pseudoparenchymatous structure with a very dark or nearly black centre and a brown peripheral layer. On maize meal agar only a few sclerotia are produced measuring 5 mm. in diameter. From these characters the fungus on *A. nardus* was identified with the sugar-cane parasite, *Rhizoctonia grisea* (Stevens) Matz [*R.A.M.*, i, p. 274], while marked similarities to *Corticium sasakii* [ibid., xiv, p. 795 *et passim*] were also observed. The perfect state of the sereh fungus has not hitherto been found in nature, but it developed in the presence of moisture in a three-week-old maize meal culture, producing basidia, sterigmata (5 to 12 by 1·7 to 2·5 μ), and basidiospores (5·5 to 8·5 by 5·5 μ). These measurements agree with those of *C. sasakii*.

Positive results were given by inoculation experiments on *A. nardus* (8 out of 12 plants), the dissemination of the pathogen being noticeably stimulated by the presence of moisture on the leaves. Rice and banana leaves and sesame stalks were also attacked. These data confirm Wakker and Went's assertion (De ziekten van het suikerriet op Java . . .) that the parasite can spread from plant to plant over the surface of the water, and Sawada's observations (Descriptive catalogue

of the Formosan fungi Part I, 1919) as to its host range. Other contributions to the relevant literature are briefly reviewed.

On sugar-cane the disease caused by *C. sasakii* is of minor importance, affecting only the leaves and sheaths. *A. nardus*, however, cultivated for the production of citronella oil from the leaves, may suffer considerable injury during the rainy season of January and February. The crop is grown as a perennial and cut four times or more a year, so that control by excision and burning of the diseased material should not be an expensive measure. Careful inspection of the rooted segments used for propagation before transplanting is advisable to prevent the spread of the pathogen.

Abbott (E. V.). **Influence of certain environmental conditions on chlorotic streak of Sugar Cane.**—*Phytopathology*, xxxvii, 3, pp. 162–173, 1947.

Both in greenhouse and field experiments in Louisiana, chlorotic streak [*R.A.M.*, xxv, p. 82] developed more extensively in sugar-cane plants raised from infected cuttings in poorly drained soil than in comparable soil with proper drainage, while secondary spread of the disease was more prevalent in plants grown from healthy cuttings in ill- than in well-drained fields. There was no significant difference in the incidence of infection in the greenhouse among plants produced by infected bud cuttings in Sharkey clay silt and Yazoo very fine sandy loam.

Applications of a nitrogenous fertilizer to young plants raised from infected cuttings increased the development of foliar symptoms. Large doses of nitrogen (200 c.c. per plant of a solution containing 10 gm. sodium nitrate per l.) at fortnightly intervals from the age of two to eight months exerted marked curative effects on the C.P. 29/103 and 29/320 varieties, but not on the others included in the tests. In the absence of additional nitrogen, recovery was more marked in the same two varieties in muck than in clay soils.

Esfandiari (E.). **Deuxième liste des fungi ramassés en Iran.** [A second list of fungi collected in Iran.]—*Ent. Phytopath. appl., Tehran, 1946*, 2, pp. 10–16, 1946.

This annotated list of fungi collected in Iran [cf. *R.A.M.*, xxi, p. 99] since the beginning of the late war supplements an earlier one that appeared in 1945, descriptions of all the new species having been published by Petrak in 1941 [ibid., xxvi, pp. 131, 173]. All the fungi mentioned are in a herbarium part of which is maintained at the École supérieure d'Agriculture, Karadj, and the remainder in the laboratory of the Ministry of Agriculture, Teheran. Among the items listed the following may be mentioned: *Pseudomonas savastanoi* on branches of olive, *Bacterium* [*Xanthomonas*] *malvacearum* on leaves and bolls of *Gossypium* sp., *Albugo* [*Cystopus*] *tragopogonis* [ibid., xxiii, p. 423] on leaves and stalks of *Tragopogon graminifolius*, *Sphaerotheca pannosa* var. *persicae* [ibid., xxiv, p. 107] on peach leaves and fruit, *S. pannosa* var. *rosae* [ibid., xxiii, pp. 90, 179] on fruits, peduncles, and thin stems of *Hulthemia* [*Rosa*] *persica*, *Leveillula* [*Oidiopsis*] *taurica* [ibid., xxiv, p. 343] on leaves of *Salvia pseudosylvestris* and other hosts, *Mycosphaerella tassiana* on ivy leaves, *Puccinia antirrhini* on *Antirrhinum majus* leaves, *Phragmidium iranicum* n.sp. on *Rubus caesius* [dewberry] leaves, *Phyllosticta jasminicola* on *Jasminum officinale*, *Sporonema punctiforme* on leaves of *Rubia tinctoria*, *Guignardia bidwellii* on vine, *Pestalotia theae* on tea [ibid., xxi, p. 324], *Helminthosporium gramineum* on wheat, and *Fusicladium dendriticum* [*Venturia inaequalis*] on apple leaves.

Goidànich (G.). **'Peyronellaea', nuovo genere di Deuteromiceti. (Nota preliminare.)** ['Peyronellaea', a new genus of Deuteromycetes. (Preliminary note.)—*R.C. Accad. Lincei*, Ser. viii, i, 3–4, pp. 449–457, 3 figs., 1946.

The author erects a new genus [without a formal or Latin diagnosis] of Sphaero-

psidales, which he names *Peyronellaea* [see above, p. 343]. It includes a number of species hitherto ascribed to *Phoma* [cf. *R.A.M.*, xxv, p. 526], but showing certain morphological peculiarities, especially multicellular chlamydosporal structures [or hypnocysts; ibid., ix, p. 240] resembling in appearance and shape the dictyospores found in hyphal Dematiaceae such as *Alternaria*, *Coniothecium*, and *Sporodesmium*. With these morphological peculiarities go others of a biological, physiological, and cultural nature, which render the group an individual, homogeneous, and distinct unity.

Peyronellaea spp. grow well on most media. The colonies are at first whitish or rose, then very dark, and characterized by an abundance of pycnidia, which may arise among the aerial chlamydospores or remote from them. On certain media they resemble Blastomycetes in the rapid multiplication by budding of the vegetative cells. The pycnidia mature in less than 64 hours, differentiation being either symphogenous or meristogenous.

The mature pycnidia are spherical, or, when they result from the confluence of different fruiting organs, irregular. Typically, they are ostiolate. In their final phase, the wall is thin and fragile. The pycnoconidia, which are unicellular, hyaline, ellipsoidal, and generally biguttulate, are not borne on conidiophores, but arise through budding of the cells lining the inside of the wall. Mucilage and spores fill the pycnidial cavity, being produced by a lysigenous process, and they emerge to form a reddish-yellow mass round the ostiole.

The chlamydospores, which become differentiated simultaneously with the pycnidia, are either 1- to few-celled (buds), or, more often, multicellular, very dark, opaque, and irregular but tending to be claviform; they are isolated or arranged in simple and branched chains. In spite of their close resemblance to the conidia of hyphal Dematiaceae they are true chlamydospores.

Species of Sphaeropsidales which the author considers should be referred to *Peyronellaea* (disregarding for the present questions of synonymy) include '*P. richardiae*' [cf. ibid., i, p. 150; xvi, p. 106], '*P. conidiogena*' [ibid., xxi, p. 315], '*P. alternariacea*' [ibid., xvi, p. 106], '*P. glomerata*' [ibid., xix, p. 601], and '*P. scabra*'. The specific denominations of the following, which are based solely on the chlamydosporal forms, should be suppressed: *A. hominis* [ibid., xvi, p. 749], *A. richardiae*, *A. polymorpha* [ibid., xi, p. 374], and *C. scabrum*.

SPARROW (F. K.). **Observations on Chytridiaceous parasites of phanerogams. II. A preliminary study of the occurrence of ephemeral sporangia in the Physoderma disease of Maize.**—*Amer. J. Bot.*, xxxiv, 2, pp. 94–97, 17 figs., 1947.

Physoderma zeae-maydis [*P. maydis*], the agent of brown spot of maize and teosinte [*Euchlaena mexicana*], in the southern United States, has been found to possess, besides the familiar macroscopic endobiotic resting spore stage, an epibiotic phase visible only under the microscope. Each of the numerous zoospores formed at the germination of the resting spore is potentially capable of producing a thin-walled, slipper-shaped sporangium, 13 to 36 by 10 to 15 μ, which rests on the outer surface of the plant and bears within the host cell a small apophysis and short, bushy rhizoidal system [*R.A.M.*, xiii, p. 691]. There is no organic connexion between the endobiotic and the epibiotic phases. The ephemeral sporangia produce numerous ellipsoid zoospores, 5 by 3 μ, furnished with a small, eccentric, refractive, colourless globule and a posterior flagellum, 15 to 20 μ in length, and differing only in their somewhat smaller dimensions from those arising from the germinated resting spores (7 by 5 μ). By analogy with *P. menyanthis* [*Amer. J. Bot.*, xxxiii, pp. 112–118, 41 figs., 1946) it is probable that the zoospores produced by the ephemeral sporangia can reinfect maize. These organs are suspected of being gametes, but no evidence is yet forthcoming to corroborate this theory. Empty sporangia may produce a second crop of zoospores by internal proliferation. The

endobiotic system did not begin to develop until after the epibiotic phase had produced its spores.

SMITH (G.). **Note on the occurrence of species of Oidiodendron Robak in Britain.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 232–233, 1946.

Notes are given on two British species of *Oidiodendron* [*R.A.M.*, xii, p. 69] in the collection of cultures made by Nobel's Explosives Co., Ltd., at Ardeer, Ayrshire, and transferred in 1931 to the London School of Hygiene and Tropical Medicine. One (Ag 109), isolated from a lichen on a wooden post, is a typical strain of *O. rhodogenum* [loc. cit.]. Growth on all culture media is slow, velvety or tufted floccose, pale grey, with an overgrowth of dirty white sterile mycelium. On maize meal or wort agar the whole mass of mycelium gradually becomes blood-red. On other media, pigment production is sparse and spasmodic. Culture Ag 112, isolated from gun cotton, agrees well with *O. fuscum* [ibid., xvi, p. 575]. Growth is slow, grey to fuscous, powdery, and there is a dirty brown pigment in the medium. Another strain of *O. fuscum*, received from Dr. A. Burges, was isolated four times from the surface humus in a pine plantation. In view of the similarity of this genus, in the gross appearance of the conidial fructifications, to *Cladosporium*, it is probable that a search through the records of the latter genus would reveal the presence of other species of *Oidiodendron* in Britain.

TUBBS (F. R.). **Blister blight.**—*Tea Quart.*, xviii, 3, p. 90, 1946.

Blister blight of tea [*R.A.M.*, vii, p. 542] probably caused by *Exobasidium vexans* [ibid., xxvi, p. 317] has been reported in Ceylon for the first time after the relaxing of the regulations prohibiting the import of tea seeds. The outbreak began quite recently on the western face of the central range of hills and has spread to 68 estates. Its frequency is highest in tipping fields, decreasing with the age of the field from pruning. In North India the fungus has fortunately proved extremely susceptible to the frequent climatic changes and therefore serious damage has been avoided. Managers have been asked to advise the Tea Research Institute of disease outbreaks, extent of damage, and weather conditions during the attacks.

MARKHAM (R.), SMITH (K. M.), & WYCKOFF (R. W. G.). **Electron microscopy of Tobacco necrosis virus crystals.**—*Nature, Lond.*, clix, 4043, p. 574, 1 fig., 1947.

Photographs of single crystals of a strain of the tobacco necrosis virus [*R.A.M.*, xxvi, p. 174] examined through the electron microscope [ibid., xxv, p. 437] suggested, in their molecular net, a frayed piece of wire screening. Measurements across 10 to 20 molecular rows indicated that the same particle separation, *c.* 275 Å, prevails both vertically and horizontally. The particle rows are approximately at right angles (95°), but the net is not strictly cubic. The studies are being continued.

CLAYTON (E. E.). **A wildfire resistant Tobacco.**—*J. Hered.*, xxxviii, 2, pp. 35–40, 4 figs., 1947.

TL 106, a selection from the back-cross between *Nicotiana longiflora*, immune from wildfire (*Pseudomonas tabaci*) [*P. tabacum*: cf. *R.A.M.*, iv, p. 510], and the susceptible commercial tobacco, has been experimentally shown to combine an exceptionally high degree of resistance to the disease with freedom from water-soaking [ibid., xv, p. 537 *et passim*] and a uniform growth habit resembling that of the standard varieties. Among the F_1 progeny of crosses between TL 106 and five commercial varieties, only five out of 1,350 plants reacted positively to inoculation with the pathogen in 1946 compared with 100 per cent. in the

1,000 controls, while 600 TL 106 plants similarly exposed also remained healthy. This type of wildfire resistance, therefore, behaves as a complete dominant. Five lots of the F_1 population of the crosses (in the green state) weighed 25, 28, 33, 34, and 51 per cent. more, respectively, than the paired controls of the susceptible parent. Three years' experimental evidence further indicates that TL 106 is highly resistant to *P. angulata*, but it is equally susceptible with commercial tobacco to a number of other diseases.

ASKEW (H. O.). **Lime-induced boron deficiency in Tobacco at Umukuri, Nelson, New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 161–166, 5 figs., 1946.

At the Tobacco Research Station, Umukuri, Nelson, a stunting of tobacco plants, accompanied by foliar chlorosis and curling, occurred on a coarse sandy soil in the second season after treatment with ground limestone at dosages of 1 and 2 tons per acre. The symptoms are reminiscent of those described by Van Schreven from Holland [*R.A.M.*, xiii, p. 600]. Analyses of soil samples showed that the limed areas contained only 0·1 p.p.m. boron compared with 0·2 for the untreated, while the boron contents of the leaves in the plots receiving 1 and 2 tons lime were 3·9 and 3·5 p.p.m., respectively, as against 6·3 in the untreated and 26·7 in those given borax at the rate of 20 lb. per acre. Growers are accordingly warned against the use of lime at rates exceeding ½ ton per acre in any one season on the soils in question.

SAMSON (R. W.). **Summer weather and Tomato blight.**—*Food Packer*, xxviii, 4, pp. 53–55, 5 graphs, 1947.

No record can be traced of outbreaks of tomato late blight [*Phytophthora infestans*] in Indiana prior to the destructive epidemics of 1945 and 1946 [*R.A.M.*, xxvi, p. 176 and next abstract], but the disease occurred on potatoes in eight out of the past 29 years, including the two in question. There are three jointly essential prerequisite conditions for the development of the pathogen on a scale of such magnitude, namely, an abundance of foliage, repeated alternations of temperature dropping to the fifties at night and reaching (but not exceeding) the low seventies by day, and the presence of moisture films on the plants for protracted periods. In 1945, the disease almost completely destroyed many tomato fields by mid-August in north and central Indiana, especially the former, where temperatures were below and rainfall above normal but caused little loss in the south, where more or less normal temperature and moisture conditions prevailed. In 1946, the wholesale introduction of the fungus on most lots of seedlings received in May and June resulted in serious failures of stand, costly replanting, and some diversion of the intended tomato acreage to other crops. This loss, however, was largely offset by a subsequent favourable growing season except in the south, where maturing crops sustained heavy reductions from late blight, correlated with abnormally low temperatures and high precipitation during July and up to late August. In 1915, the coolest and wettest summer since 1887, late blight must have been destructive in Indiana, and at least one canner does indeed recollect a situation comparable with that of 1945.

All the available evidence points to the source of tomato late blight in the shoots arising from infected potato tubers, since the pathogen does not overwinter in tomato seed, in the soil, or in dead plant tissue. It is possible, though unlikely, that direct transfer from severely blighted early potatoes to tomatoes in southern Indiana may have taken place in 1945 and 1946. The potato strain of *P. infestans* must traverse some six or seven adaptive cycles in the tomato, requiring a minimum of 30 days, before acquiring full virulence towards the latter host, and this process would be retarded by intervening periods of higher temperature or lower rainfall. It seems more probable, therefore, that adaption of the potato strain to tomatoes

occurred on winter crops in the south. The subsequent dissemination northwards may have been effected by means of direct shipments of seedlings, as in 1946, or by spread to successively later and more northerly plantings up through the Mississippi Valley in early spring.

The probably infrequent and unpredictable recurrence of late blight on Indiana tomatoes presents a real problem in the application of control measures, but five good sprays or dusts at ten-day intervals from early July onwards should insure the grower against late blight, the premium being paid with the increased yields and quality consequent on the simultaneous prevention of such diseases as leaf spot (*Septoria*) [*lycopersici*], early blight [*Alternaria solani*], and anthracnose [*Colletotrichum phomoides*].

COOK (H. T.). **Our method for forecasting Tomato late blight.**—*Food Packer*, xxviii, 5, pp. 69–70, 5 graphs, 1947.

Late blight (*Phytophthora infestans*), according to the Plant Disease Survey covering the 30-year period from 1917 to 1947, caused serious damage to the Virginia early potato crop in not more than two years (1938 and 1946) and to tomatoes in only one (1946) [see preceding abstract]. Routine control measures against a disease of such infrequent occurrence would not be sound practice, and a method has therefore been devised of warning growers several weeks in advance of the likelihood of outbreaks, based on their relation to the temperature and rainfall in May, June, and July in the State during the last 17 years. The data for those months are used because the first signs of the disease appear about 20th May. The initial development of infection would depend on the weather during the preceding fortnight and its subsequent course on a continuation of favourable conditions into June or possibly July.

The average weekly temperature was generally lower in the two blight years than in the 15 when it was absent, and remained below 75° F. about a week longer in the former than in the latter. The average cumulative rainfall beginning the second week in May was continuously heavier in 1938 and 1946 than in the other years covered by the Survey. It is proposed to make the forecasts, beginning the second week in May, by plotting the average weekly temperature and cumulative rainfall at weekly intervals on graph paper on which the median or 'critical' lines for those factors have been drawn. The 'critical' line for rainfall is drawn as nearly as possible half-way between the lines for blight and non-blight years, and the 'critical' temperature line at 75°.

Spraying or dusting will be recommended after a consecutive fortnight in May when both temperature and rainfall have been propitious to the development of the pathogen, and advice to discontinue control measures will not be issued until after a consecutive fortnight in which either or both these factors have been unfavourable. Had this method been available in previous years, prophylactic treatments would have been recommended in the two blight years as well as in two (1934 and 1943) when the disease did not occur, and the predictions would thus have been 88 per cent. correct with an error of two out of 13 years.

McLEAN (D. M.) & BJORNSETH (E. H.). **Control of anthracnose on cannery Tomatoes; two years' results.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 4, pp. 287–293, 1 fig., 1946.

The ten-State co-operative trial in tomato anthracnose (*Colletotrichum phomoides*) control initiated in 1944 at the Ohio Agricultural Experiment Station [*R.A.M.*, xxvi, p. 36] was resumed in Michigan in 1945, when the following treatments were applied to a five-acre field of the Greater Baltimore variety: (1) Bordeaux 8–4–100, (2) zerlate 2–100, (3) fermate 2–100, (4) alternating fermate 2–100 and tribasic 4–100, beginning and ending with fermate in a five-application schedule at ten-day

intervals from 18th July onwards. Fermate alone gave the best control, reducing the percentage of infection from 10·6 in the untreated plots to 0·9, followed by zerlate (1·5) and the alternating sprays (2·4); Bordeaux was quite ineffectual (10).

In another test, using 200 plants of John Baer inoculated at the base with sterilized wheat cultures of the pathogen, five applications were made at ten-day intervals, starting on 27th July, with (1) zerlate plus calcium arsenate 2–4–100, (2) alternating fermate plus calcium arsenate 2–4–100 and tribasic plus calcium arsenate 4–4–100, (3) fermate plus calcium arsenate 2–4–100. The percentages of anthracnose in the plots treated with (1), (2), and (3) were 1·7, 1·7, and 4·2, respectively, as against 4·4 in the controls. In this experiment the control of *C. phomoides* was complicated by severe outbreaks of early and late blights (*Alternaria* [*solani*] and *Phytophthora infestans*), resulting in heavy defoliation, the percentages of which for treatments (1), (2), and (3) on 11th September were 14, 7, and 23, respectively, compared with 35 in the controls.

The following figures are taken from a summary by J. D. Wilson, of the Ohio Agricultural Experiment Station, of 13 experiments in the co-operative anthracnose control project: fermate plus calcium arsenate 2–4–100, 8·24 per cent. infection; zerlate plus calcium arsenate 2–4–100, 6·82; fermate and tribasic alternating, 7·49; and untreated, 20·34, the corresponding yields (in tons per acre) of saleable fruit being 10·45, 10·92, 11·28, and 9·28, respectively.

GÄUMANN (E.) & JAAG (O.). **Die physiologischen Grundlagen des parasitogenen Welkens. I.** [The physiological bases of parasitogenic wilting. I.]—*Ber. schweiz. bot. Ges.*, lvii, pp. 3–34, 3 diags., 13 graphs, 1947. [French summary.]

Using an experimental method enabling the absorption of water by detached tomato shoots and their cuticular and stomatal transpiration to be continuously followed under constant external conditions (*Ber. schweiz. bot. Ges.*, xlv, pp. 411–518, 1936), the authors distinguished four phases in the toxic action of lycomarasmin, a wilting substance secreted by *Fusarium* [*bulbigenum* var.] *lycopersici*, the agent of tomato wilt [*R.A.M.*, xxvi, p. 220]. In the first place, the addition of the toxin to the nutrient solution induces a 'shock' phase, lasting two to three hours and expressed only in the simultaneous diminution of water absorption and transpiration resulting from a disturbance of the water balance. The lycomarasmin concentration does not affect the moment of occurrence of the 'shock' effect but merely its intensity: at 10^{-2} M lycomarasmin, for instance, the water-absorption and transpiration curves sink to about one-third and at 10^{-3} to two-thirds of the initial values, whereas at 10^{-4} and 10^{-5} the influence of the toxin is barely perceptible.

On recovery from the 'shock', the water-absorption and transpiration curves tend steeply upwards, indicating a phase of temporary intensification, notably of transpiration, which may exceed absorption by half as much again. During the 'shock' phase, therefore, supplementary moisture from the cell contents must have entered the transpiration stream, a process reflected in the reduction of the total fresh weight of the shoot.

After five to eight hours the phase of temporary excess of transpiration comes to an abrupt end and is succeeded by collapse of the water economy. The transpiration and water-absorption curves now sink continuously at all the lycomarasmin concentrations tested (10^{-2} to 10^{-5} M), and since the amount of water lost constantly exceeds that taken up, there is a further reduction in the fresh weight of the shoot. At 10^{-2} and 10^{-3} M lycomarasmin an irreversible pathological wilting develops, the symptoms of which appear immediately or within five hours after the culmination of transpiration at the higher dosage and in ten hours at the lower one.

The theory is postulated that the primary cause of the pathological wilting does not lie in the loss of water, but that both the wilt and the water deficit are a sequel to the pollution of the host cell protoplasts by the toxic metabolic products of the fungus, and more especially to the deterioration of the semi-permeability of the plasma membrane. The 'shock' effect coincides with the infiltration of lycomarasmin into the tissues. At concentrations of 10^{-2} and 10^{-3} M lycomarasmin the plasma layers are damaged to such an extent that some of the protoplasmic constituents pass into the transpiration stream. The superfluity of water leads to the temporary excess of transpiration, and the extrusion into the transpiration stream of cellular substances disorganizes the osmotic conditions contributing to turgor and results in irreversible pathological wilting. At the lower concentrations of 10^{-4} and 10^{-5} M, the toxin merely disturbs the water economy of the protoplasts, the semi-permeability of the plasma membranes remaining intact. This maladjustment induces a permanent excess of transpiration but no pathological wilting.

Light appears to be a decisive factor in the development of wilt under the influence of lycomarasmin at 10^{-3} M, no pathological symptoms developing in darkness at this concentration and the same water loss.

Dodge (B. O.). **The brooming disease of Walnut.**—*J. N.Y. bot. Gdn*, xlviii, 569, pp. 112–114, 2 figs., 1947.

During the summer of 1942, several witches' brooms were formed on young Japanese walnut (*Juglans sieboldiana*) in the New York Botanic Garden. They consisted of numerous proliferations at intervals along the larger branches and at their ends, the leaves at these points being much stunted and otherwise deformed. The excrescences were removed periodically and no fresh ones developed until 1945, when about a dozen appeared on the lower branches and a larger broom on a lateral branch near the top of the main stem. During the early summer of 1946 many new outgrowths were produced along most of the limbs, large masses of malformed leaves and flower clusters combining to make up the brooms. The new brooms grow up vertically like the suckers of peach trees affected with the yellows virus. In March, 1947, the dried pistillate inflorescences were still persisting.

A similar disease observed by L. M. Hutchins and H. V. Wester on walnuts and butternuts [*J. cinerea*] in the eastern United States was found to be graft-transmissible, and in the absence of a visible pathogen is attributed by these workers to virus agency (*Phytopathology*, xxxvii, p. 11, 1947). This would seem to be a plausible explanation of the New York walnut disease, which is therefore systemic and should be combated by the extirpation of affected trees.

Twyman (E. S.). **Notes on the die-back of Oak caused by Colpoma quercinum (Fr.) Wallr.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 234–241, 1 pl., 3 figs., 1946.

Colpoma quercinum is a phacidiaceous, inoperculate Discomycete which causes a die-back of young oak-trees, coppiced oak, and the smaller terminal branches of older trees. Apothecia usually occur on dead twigs and branches, but sometimes may be found on the diseased side of a living branch. The apothecial hymenium consists of clavate asci measuring 130 to 150 by 9 to 10 μ, with bluntly pointed apices and paraphyses with curled tips. The asci contain eight hyaline elongated spores measuring 15 to 115 by 1·5 μ. The mode range of ascospore length is 40 to 65 μ.

The acervuli of the type of the Melanconiaceae appear on newly infected twigs before the apothecia, but are usually closely associated also with young apothecial rudiments. The shape of an acervulus is that of a truncated cone with a basal

layer of pseudoparenchyma 0·04 to 0·05 mm. thick. From the centre of this a pseudoparenchymatous cone extends upwards towards the opening, through which it sometimes protrudes. Conidiophores 50 μ long arise from the basal parenchyma on each side of the core. Under the periderm, immediately above the conidiophores and conidia and extending from the opening to the edge of the basal parenchyma, is situated a thin weft of loose hyphae which remains in position if the periderm is carefully removed. Under this thin layer of fungal tissue, the five to seven locules of the acervulus appear radially round the dark brown central core of pseudoparenchyma. The locules are delimited from the host tissue by a thin layer of black pseudoparenchyma, and the conidia are extruded from the ruptured periderm as a cream or reddish globular mass.

Measurements of 1,600 conidia from agar cultures showed that the spore lengths had a mode range of 3·9 to 4·8 μ with a variation of 2·4 to 7·3 μ. The mode range of the length of spores from naturally infected material was 4·4 to 5·3 μ. Observations suggested that the conidia arise in basipetal succession. The branched or unbranched conidiophores vary greatly in length. Sometimes numerous branched conidiophores and sterile hyphae become grouped, forming an elongated coremial-like structure terminating in a few sterile hyphae.

In diseased wood the mycelium travels longitudinally in the vessels and tracheids and radially in the cells of the medullary rays. Black lines, formed by aggregated, brown-walled, inflated hyphae filling the lumina of cells of the xylem and pith are present in the diseased stems. If the periderm was removed, a line could be seen surrounding one or more apothecia, under which was a pocket of diseased wood completely delimited by a black zone. This passed radially into the wood and joined up with others running in a longitudinal direction. The mycelium destroys the phloem and cortex, but the periderm is not attacked. A gum barrier laid down between infected and healthy wood was found to contain a ligno-tannin complex.

Robertson (N.) & Macfarlane (I.). **The occurrence of perithecia of the Oak mildew in Britain.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 219–220, 1946.

In October, 1945, the authors found six perithecia of the oak mildew on a living leaf of oak (*Quercus robur*) at Bricketwood, Hertfordshire. The fungus belonged to *Microsphaera*, and showed elliptical to barrel-shaped conidia measuring 25 to 37 by 15 to 22 (average 31 by 19) μ, perithecia 180 to 200 μ in diameter, with 20 to 24 appendages 170 to 300 μ long, and spores (20 from three perithecia) measuring 18 to 24 by 6 to 13 μ. As the fungus agrees closely with the description of the original authors and also with that of Blumer (Beitr. zur Kryptogamenflora der Schweiz, p. 316, 1933) it is provisionally identified with *M. alphitoides* [*R.A.M.*, viii, p. 411]. It agrees closely with exsiccatus no. 3099 of Sydow's Mycotheca Germanica, issued as *M. alphitoides*. The average diameter of the perithecia found at Bricketwood is 180 μ, as against Blumer's 116 (range 103 to 130) μ, but the other characters are the same. One collection of *M. densissima* (from New York) was seen from which it was difficult to differentiate *M. alphitoides* on morphological grounds alone, though the distal dichotomy of the appendages in *M. densissima* appears to be more elaborate. This last character is variable, however, and perithecia were observed in which the appendages closely resembled those of the authors' specimens and Sydow's 3099. The type collection of *M. alphitoides* is the perithecial material collected by Arnaud and Foëx and identified by them with the American *M. quercina* [loc. cit.]. Since the first discovery of the perithecia in 1911, the descriptions and collections of the oak mildew in Europe have been consistent, the fungus is distinctive among the oak mildews for its thick, white mycelium and it is more or less confined to the European oaks, with records on beech and sweet chestnut. In view of this consistency, it would appear to be advisable to maintain

M. alphitoides as the name of the European oak mildew until further work on the American forms has settled its identity.

URQUIJO (P.). **Sobre las diferentes estirpes de Phytophthora cambivora (Petri) Buisman y su distinta resistencia al cobre.** [On the different strains of *Phytophthora cambivora* (Petri) Buisman and their individual resistance to copper.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiv, pp. 315–320, 1 fig., 1 graph, 1946.

In tests on the individual reaction to copper sulphate of eight strains of *Phytophthora cambivora*, the agent of chestnut ink disease [*R.A.M.*, xxiii, p. 375], Petri's and Leonian's were the most sensitive, succumbing to a dose of 1 in 200,000, followed by Dufrénoy's (1 in 50,000) and the *Juglans* isolate (1 in 30,000), while concentrations of 1 in 10,000 were necessary to destroy the isolates from *Castanea dentata*, *Erica*, Coruña, and Meirás. To ensure the efficacy of the curative treatment with copper oxychloride or copper carbonate, the trunk and roots should be given a preliminary washing with a solution of copper sulphate (minimum strength 2, preferably 4 per cent.) at pH 5.

The above-mentioned differences in sensitivity to copper of the eight isolates of *P. cambivora* under observation provide an important taxonomic criterion, on the basis of which they fall into three groups, (1) isolates from *C. dentata*, *Erica*, Coruña, and Meirás, withstanding copper concentrations of 1 in 20,000; (2) the Dufrénoy and *Juglans* isolates, resistant to 1 in 100,000; and (3) those of Petri and Leonian, succumbing to dosages above 1 in 300,000. These new observations would appear to necessitate a revision of the specific nomenclature of the fungus, applying *P. cambivora* to Petri's and Leonian's strains and *P. verrucosa* [ibid., xx, p. 91] to the *C. dentata*, *Erica*, Coruña, and Meirás isolates; Dufrénoy's is probably a variant of the former species and the *Juglans* isolate of the latter.

CARTER (J. C.). **Tubercularia canker and dieback of Siberian Elm (Ulmus pumila L.).**—*Phytopathology*, xxxvii, 4, pp. 243–246, 1 fig., 1947.

Tubercularia ulmea n.sp., the agent of a canker and die-back of the Siberian elm (*Ulmus pumila*) in Illinois, produces on the diseased bark erumpent, pulvinate, scattered or gregarious, black sporodochia, of a horny consistency when dry, up to 1·5 mm. in diameter and 0·9 mm. in height; hyaline, irregularly ramose, crowded conidiophores, straight or strongly curved, 35 to 87 by 1 to 3·5, mostly 45 to 65 by 1·5 to 2·5 μ, with branches 4 to 10 by 1 to 1·3 μ; and acrogenous, hyaline, continuous, ovoid to oblong, occasionally allantoid conidia, 3·8 to 9·3 by 1·4 to 3·4, mostly 4·6 to 6·2 by 1·5 to 2·3 μ.

The cankers on the branches and trunks appear during April and May in the form of oval to elongated, slightly sunken areas. The surface of the infected bark assumes a reddish-brown tinge and becomes dotted with black sporodochia, the interior turning brown to black as it dies and shrivels. The cankers continue to expand until mid-June, when callus tissue begins to develop at their margins. Cracks may form in the diseased bark, often at the border of the canker, as the callus tissue spreads over the infected area. The diseased bark is pushed outwards, breaks, shreds, and usually peels off before the process of callus formation is complete. None of the cankers, either natural or artificial, under observation enlarged in succeeding years.

T. ulmea was found developing in the bark of diseased Siberian elms in both nursery and ornamental plantings, and on twigs dying from excess of shade in the inner part of the crown.

Six out of seven trunk and 17 out of 18 branch inoculations made in April, 1940 on 21 trees were successful, the disease thus induced pursuing a similar course to that described for the natural infections. Many of the inoculated branches were

girdled by the fungus and died distal to the site of invasion within 35 days. Callus had formed over most of the smaller cankers by late August, but the larger ones were not completely covered for one or two years.

PARKER (K. G.), TYLER (L. J.), WELCH (D. S.), & POPE (S.). **Nutrition of the trees and development of Dutch Elm disease.**—*Phytopathology*, xxxvii, 4, pp. 215–224, 1947.

The results of experiments on small elm (*Ulmus americana*) trees potted in a very poor Gloucester loose soil at Cornell University, Ithaca, New York, indicated that a complete fertilizer treatment (5:10:5) may mitigate the severity of infection by *Ceratostomella ulmi* [cf. *R.A.M.*, xix, p. 559]. The soil treatments should not be excessive and should be well balanced. Nitrogen and phosphorus, especially the latter, appeared to be of major importance in promoting vigorous growth of the trees, the role of potassium being subsidiary, though this element did produce a beneficial effect in the particularly inadequate soil used in the tests. Experiments on larger trees in the open showed similar results but the growth differences and differences in disease development were less. When a good response to complete fertilizer was obtained the disease was less severe than in unfertilized poorly growing controls. No clear-cut differences could be observed between the various sources of nitrogen employed, namely, sodium nitrate, urea, or a mixture of urea and farmyard manure. There appeared to be no danger in maintaining the trees in good condition, provided they are not drastically pruned and a succulent growth is produced. It is thought that differences in the hydrogen-ion concentration of the soil may provide a clue to the variations in the development of the disease, but this aspect of the subject demands closer investigation.

GOIDÀNICH (G.). **Il problema della grafiosi dell' Olmo nella fase risolutiva.** [The problem of graphiosis of the Elm in its destructive phase.]—Reprinted from *Ann. Accad. Agric. Bologna*, N.S., i, 23 pp., 13 figs., 1941. [Received May, 1947.]

In this paper, read before the Bologna Academy of Agriculture on 1st December, 1939, the author gives a succinct yet comprehensive account of Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xxv, p. 530; and preceding abstract], with particular reference to Italian conditions. The points dealt with include the external and internal symptoms of the disease, parasitism of *C. ulmi*, etiology, predisposing factors, and control by the use of resistant varieties.

THIRUMALACHAR (M. J.), NARASIMHAN (M. J.), & GOPALAKRISHNAN (K. S.). **Morphology of spore forms and heteroecism of the Giant Bamboo rust, Dasturella divina.**—*Bot. Gaz.*, cviii, 3, pp. 371–379, 12 figs., 1947.

Throughout large forest tracts in South India the giant bamboo (*Dendrocalamus strictus*) is heavily parasitized by the uredo- and teleutosori of *Dasturella divina* [*R.A.M.*, xxii, p. 454], the pycnidia and aecidia of which are formed on *Randia dumetorum*. The genetic connexion between the alternate stages of the rust was first surmised from this constant association in bamboo forests and was later demonstrated by inoculation experiments. The systemic invasion of *R. dumetorum* is followed by marked hypertrophy and the formation of witches' brooms. Aecidiospores from the alternate host infected the leaves of the giant bamboo, the incubation period ranging from 27 to 34 days, while uredospores were responsible for the further spread of the disease.

Contrary to the observations of Mundkur and Kheswalla [loc. cit.], the senior author found that the teleutosori are composed of unicellular, catenate spores produced in basipetal succession. The accommodation of the genus in Dietel's tribe Ochrosporae is proposed.

Schwarzman (Mme S. R.). О новом виде гриба. **Cenangium kazachstanicum Schwarzm. sp.n.** [On the new fungus species *Cenangium kazachstanicum* Schwarzm. n.sp.]—*Bull. Soc. Nat. Moscou*, li, 4–5, pp. 137–145, 1 fig., 1946. [English summary.]

Cenangium kazachstanicum n.sp., the agent of a die-back of Scots pines (*Pinus sylvestris*) in the Akmolinsk district of North Kazakhstan, U.S.S.R., first observed in 1932 and causing heavy mortality from 1938 to 1942, was shown by a comparative morphological study to differ in the following particulars from *C. abietis* [*R.A.M.*, xxv, p. 283] and its vars. *japonica* and *olivaceo-nigra*. The ascospores of *C. kazachstanicum* may be either hyaline or brown, the former measuring 6·4 to 10 by 4·8 to 6·8 and the latter 7·5 to 12 by 5·3 to 8 μ, whereas those of *C. abietis* and its vars. *japonica* and *olivaceo-nigra* are uniformly colourless, hyaline to pale yellow, and hyaline, respectively, and measure 10 to 12 by 5 to 7, 10 to 12 by 7 to 8, and 12 to 13 by 4 to 4·5 μ, respectively. The hyaline to yellow-cinnamon paraphyses of *C. kazachstanicum* measure 4·5 μ and those of *C. abietis* and its var. *japonica* (which are colourless) 6 and 1·5 to 2 μ, respectively. The average dimensions of the apothecia of the new species, *C. abietis*, and its two varieties are 1·3 by 1·1, 1·5 to 3, 1·5 to 2·5, and 2 to 4 mm., respectively.

Zabel (R. A.). **Poria obliqua on dying Beech.**—*Phytopathology*, xxxvii, 3, pp. 189–190, 1 fig., 1947.

Near Tully, New York, in August, 1946, a fertile fruit body of *Poria obliqua* [*R.A.M.*, xxii, pp. 157, 184] was observed on a dying beech (*Fagus grandifolia*) trunk, in cross-sections of which black zone lines were detected separating advanced from earlier stages of decay [ibid., xviii, p. 145]. In areas of living sapwood the zone lines were cinnamon-brown, less distinct, and appreciably wider than elsewhere. The lumina of many cells in the zone lines were found on microscopic examination to be filled with swollen, brown hyphae, while others appeared to contain an amorphous, dark-coloured substance. A thin mycelial mat, composed of brown, thick-walled hyphae, was present at the edges of the sporophore a little nearer the heartwood than the black zone line. As the fruit body developed, it forced off the decayed and a layer of the sound sapwood up to 10 mm. in thickness. The sporophore was in close contact with the living sapwood.

The presence of *P. obliqua* on a still-living tree suggests the advisability of removing live material bearing sterile, rimose 'conks' from the forest in the course of sanitation cuttings.

Boudru (M.). **La crise du Pin laricio de Corse en Belgique.** [The Corsican Pine crisis in Belgium.]—*Bull. Soc. for. Belg.*, liv, 2, pp. 49–94, 7 figs., 1947.

After stating that plantations of Corsican pine [*Pinus nigra* var. *calabrica*] in various parts of Belgium have since 1939 shown a form of wilt associated with a rather high mortality, the author gives a detailed account of the condition and of the following fungi found on cracks and swellings in the bark of the affected trees, viz., *Dasyscypha calyciformis* [*R.A.M.*, xxii, p. 413] at Raevels, *Crumenula pinicola* [ibid., xxv, p. 587] at Genck, and *C. abietina* [ibid., xxv, p. 283 and next abstract], not before observed in Belgium, at Koursel, at Exel, and generally in the eastern part of the Campine.

Investigation showed that in every case the wilt and resultant mortality were due primarily to frost injury sustained during a succession of exceptionally severe winters, the fungi being either saprophytic or only weakly parasitic. The paper concludes with a full discussion of the suitability of *P. nigra* var. *calabrica* to the climatic conditions prevailing in Belgium.

Boudru (M.). **Note sur la fréquence, en Belgique, de Crumenula abietina Lagerberg.** [Note on the frequency in Belgium of *Crumenula abietina* Lagerberg.]—*Parasitica*, ii, 4, pp. 113–115, 1946.

Further observations are recorded on *Crumenula abietina* [see preceding abstract] in Belgium, including a preliminary list of the new conifer hosts on which it has been observed.

Boudru (M.). **L'état sanitaire, en Belgique, du Sapin de Douglas (Pseudotsuga taxifolia Britt.).** [The sanitary condition in Belgium of the Douglas Fir (*Pseudotsuga taxifolia* Britt.).]—*Parasitica*, ii, 4, pp. 125–127, 1946.

This is a brief review, from the literature, of the distribution in Belgium of *Rhabdocline pseudotsugae* [*R.A.M.*, xxi, p. 434], *Phomopsis pseudotsugae* [ibid., xix, p. 178], and *Phaeocryptopus gaeumanni* [ibid., xxvi, p. 221], attacking Douglas fir (*Pseudotsuga taxifolia*). *Phomopsis pseudotsugae* has not been found by the author in Belgium but *R. pseudotsugae* is prevalent in the following localities; Mont-lez-Malmédy, Tervueren, Hoeylaert (Groenendael), Serinchamps, Gedinne, Spa Wijchmael, and Beverloo. Three localities are added to the previous list for *Phaeocryptopus gaeumanni*.

Petrini (S.). **Om Granrötans inverkan på avverkningens rotvärde. Specialundersökningar i Lanforsbeståndet 1938 och 1941.** [On the influence of Spruce root rot on the yield from clear-cutting. Special investigations in the Lanfors stand 1938 and 1941.]—*Medd. Skogsförsöksanst., Stockh.*, xxxiv, pp. 327–340, 1 graph, 1946. [German summary.]

In connexion with a systematic registration of increment and clear-cutting in a practically pure spruce stand, attention was paid to the damage to the felled trees from the prevalent root rot in Sweden caused by *Fomes annosus* [see next abstract], which was assessed by comparing the actual with the potential value of each trunk. The results showed an average reduction in the 269 trees felled in 1938 of 10·6 per cent., the corresponding figure for the 372 cut down in 1941 being 9·6, or 7·7 restricting the calculations to exactly the same areas in both years, whence it appears that the worst-damaged trees were eliminated at the first cut. It should be noted that healthy trees are also comprised in the thinning-out necessitated by the regeneration programme and included in the average figures.

A relationship was calculated between the extent of the rot on the one hand and the percentage reduction in value of the damaged tree on the other. The material consisted of 209 trees with root rot, using as indicator the percentage of tree length, reckoned from the base upwards, rendered valueless either for logs or wood pulp by *F. annosus*. Sorting was effected *in situ*, the damaged portion of the trunk being sawn off and used as firewood. Up to 40 per cent. decay the value of the wood sank fairly rapidly, more so in the class of 30 to 40 cm. at breast height than in that of 15 to 20 cm., but an incidence of rot exceeding 50 per cent. was not accompanied by a parallel devaluation.

Rennerfelt (E.). **Om rotrötan (Polyporus annosus Fr.) i Sverige. Dess utbredring och sätt att uppträda.** [Concerning root rot (*Polyporus annosus* Fr.) in Sweden. Its distribution and mode of occurrence.]—*Medd. SkogsforskInst., Stockh.*, xxxv, 8, pp. 1–88, 17 figs., 16 diags., 1 graph, 1 map, 1947. [German summary.]

Some of the information in this comprehensive study of root rot (*Polyporus* [*Fomes*] *annosus*) [see preceding abstract] in Sweden has already been noticed from another source [R.A.M., xxv, p. 374]. The growth rate of the mycelium was determined by inoculation into spruce stems: the maximum distance from the site of

entry traversed in two years was 132 cm. Of 784 increment cores obtained by sterile drilling in different parts of the country, 440 were infected by *F. annosus*, and from 213 (48 per cent.) of these the fungus developed in pure culture, the remainder being contaminated by extraneous organisms, including such agents of blue stain (29 or 7 per cent.) as *Cladosporium herbarum*, *Pullularia pullulans*, *Alternaria*, *Ophiostoma* [*Ceratostomella*] and *Phialophora* spp. and hyaline mycelia, e.g., of the moulds *Penicillium* and *Trichoderma* spp. (64, or 14·5 per cent.). Other wood-destroying fungi cultured from 328 of the cores, mostly collected in the interior of Norrland (or Lapland), included *Armillaria mellea* (11), *Polyporus* [*Fomes*] *pini* (18), *Stereum sanguinolentum* (19), and *Coniophora* spp. (21).

F. annosus is prevalent in forests with an undergrowth of *Vaccinium myrtillus* and *V. vitis-idaea* [cf. ibid., xxv, p. 193], while heavy infection has also been observed on permeable and dry soils. No direct correlation could be established between root rot and the hydrogen-ion concentration texture, or structure of the soil. In 20- to 30-year-old pine stands in the south-west of Sweden the disease assumes a devastating form; at 50 years and upwards the trees are mostly resistant, but deaths have been observed among them.

HARRINGTON (T.). **Some aspects of timber preservation with water-soluble preservatives.**—*Timb. News Sawm. Engnr*, lv, 2092, pp. 51, 70, 1 fig., 1947.

Recent developments in timber preservation by means of water-soluble preservatives are briefly surveyed, with special reference to Wolman salts [*R.A.M.*, xxv, p. 324], the chromium constituent of which has non-corrosive as well as fungicidal properties. This is a matter of some importance in view of the fact that the cost of a modern timber pressure impregnation plant, with its one or more pressure cylinders, measuring vessels, vacuum chests, pumps, and large-capacity storage tanks, is in the region of £10,000 to £15,000. Experiments are now in progress to obtain deep penetration by the use of very high pressures (up to 1,000 lb. compared with the normal 200 lb. per sq. in.). Both the Boucherie and Osmose processes [ibid., xxi, p. 235; xxii, p. 84], which give good sapwood penetration, require the co-operation of the forester which is freely available in Germany and elsewhere and should be encouraged in this country.

Service and regulatory announcements. October–December 1945. Plant quarantine import restrictions.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 165, pp. 76–77, 78–81, 1945. [Received July, 1946.]

Proclamation No. 48 of 1940 repeals Proclamation No. 155 of 1939 [*R.A.M.*, xviii, p. 832], thus restoring the regulations regarding the import of potatoes into South Africa to those cited on p. 6 of *B.E.P.Q.* 471. A Customs rebate on duty is made on production of a certificate declaring that the potatoes were grown without risk of infection and that they were sufficiently free from virus diseases to ensure suitable progeny for seed purposes.

A summary is given of the plant-quarantine import restrictions embodied in the Statutory Rules and Orders No. 37 of 1942 and No. 5 of 1944 which prohibit the importation into Dominica of citrus fruits, cotton, and cotton products from the United States and certain other countries. The importation of the following plants and their parts is prohibited except under permit: banana, cacao, citrus species, coco-nut, sugar-cane, coffee (except roasted), gramineous plants except straw used as packing material, plants in soil, and soil and dung containing earth debris. Fruit and all parts of allspice [pimento] (*Pimenta* spp.) are not allowed to be imported from the Greater Antilles on account of *Puccinia psidii*. Plant material (with the exception of certain products) is not permitted to enter by air express.

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EDÉN (J.) & RENNERFELT (E.). **Undersökningar enligt klotsmetoden av några träimpregneringsmedel.** [Investigations on some timber preservatives by the wood-block method.]—*Medd. SkogsforskInst., Stockh.*, xxxv, 10, pp. 1–36, 5 figs., 1 diag., 1947. [German and English summaries.]

The first task of a joint committee appointed by the Swedish State Railways, Telegraphs, and Water Board in collaboration with the Boliden Mining Company in 1941 was a comparative mycological investigation by the German DIN DVM2176 wood-block method [*R.A.M.*, xxv, p. 376] of the relative value as timber preservatives of basilite UA [ibid., xxi, p. 277], Boliden salt (a mixture of arsenic acid plus sodium arsenate, sodium bichromate, and zinc sulphate) [cf. ibid., xv, p. 414], and Boliden fluorine salt. The salts were used in part at the prescribed rates and in other tests at concentrations exceeding and falling below the standard dosage by 25 and 50 per cent., respectively, while the creosote oil was applied in amounts of 75 and 150 kg. per cu. m. sapwood. A number of the treated blocks were leached in running water for a month, while some of those impregnated with creosote were subjected to vacuum-drying before inoculation in Kolle flasks with *Coniophora cerebella* [*C. puteana*], *Lenzites sepiaria, Lentinus squamosus* [*L. lepideus*], *Polyporus vaporarius* [*Poria vaporaria*], *Trametes serialis*, and *T.* [*Lenzites*] *trabea*: ibid., xv, p. 761]; all the cultures were of Swedish provenance, with the addition in the cases of *Lentinus lepideus* and *P. vaporaria* of German collections.

At the close of the four-month period covered by the experiments, there was no perceptible damage on the salt-treated, unleached blocks or on those impregnated with creosote, whether subsequently leached or not. Substantial injury, accompanied by a loss of weight ranging from 12 to 22 per cent., developed only in leached blocks treated with basilite UA at the minimum dosage of 3 kg. per cu. m. and inoculated with *C. puteana*. A German isolate of *L. lepideus* attacked leached blocks previously impregnated with basilite UA at the normal and excess concentrations of 6 and 7·5 kg. per cu. m., respectively.

Blocks treated with the minimum quantities of Boliden salt or fluorine salt (8·75 and 2·5 kg. per cu. m., respectively), then leached, sustained slight infection by *P. vaporaria* (German provenance), but at the normal dosages of 17·5 and 5 kg. per cu. m., respectively, both preparations conferred adequate protection. *L. lepideus* was the most destructive of the fungi used in the tests, followed by *P. vaporaria*, the German collections being uniformly more virulent than the Swedish.

MEYER (E. I.). Стимулирующее действие грибов синевы на развитие домовых грибов. [Stimulatory action of staining fungi on the development of house fungi.]—*Bull. Soc. Nat. Moscou*, Sect. biol., N.S., li, 2, pp. 33–45, 2 figs., 7 diags., 1946. [English summary.]

The interrelations of the agents of blue stain in timber, *Alternaria humicola* [*R.A.M.*, xviii, p. 774], *Ceratostomella coerulea, C. piceae, Discula pinicola* var. *mammosa* [cf. ibid., xvi, p. 574], *Hormonema dematioides* [*Pullularia pullulans*;

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ibid., xiv, p. 270; xxi, p. 356], and *Leptographium* [or *Scopularia*] *lundbergii* [ibid., xv, p. 827], and the house fungi, *Coniophora cerebella* [*C. puteana*], *Merulius lacrymans*, and *Poria vaporaria*, were studied in beer wort-agar cultures and in fresh pine sapwood.

In pure culture on beer wort-agar the growth of *P. vaporaria* was promoted by *A. humicola* and *L. lundbergii*, while the latter, *Ceratostomella coerulea*, *C. piceae*, and *Pullularia pullulans*, acted similarly on *Coniophora puteana*. In the other cases the relations between the blue-staining and the house fungi were antagonistic or indifferent.

In the *in vivo* experiments wood blocks, 2 by 2 by 3 cm., were inoculated with the blue-stain organism and transferred for a period of two months to flasks containing cultures of the house fungi. The growth of all three of the latter was stimulated by *L. lundbergii*, while *Poria vaporaria* and *C. puteana* responded favourably to *Pullularia pullulans*.

Green (D. E.). **Black spot disease of Brassica seed crops.**—*Gdnrs' Chron.*, Ser. 3, cxxii, 3149, pp. 178–180, 1 fig., 1947.

From time to time during the last five years the seed-bearing stalks of various species of *Brassica*, such as cabbage, cauliflower, and kale, examined at the Royal Horticultural Society's Laboratory, Wisley, have been found to bear the circular black patches produced by *Alternaria oleracea* [*R.A.M.*, xxv, p. 244]. The pods may be killed or ruptured prematurely so that much seed is lost, while a good deal is also thought to be infected and weakened by the fungus. The lateral branches and the siliquae and their stalks may also be infected, and in wet weather the disease spreads so rapidly that reductions of up to 75 per cent. of the crop have been reported. The best means of control would probably be a prophylactic application of Bordeaux mixture or colloidal copper, supplemented by a good spreader since the coverage of these crucifer leaves presents considerable difficulty.

Oort (A. J. P.). **Bepaalt het gehalte aan mosterd-olie de resistentie van cruciferen tegen knolvoet?** [Does the mustard-oil content determine the resistance of crucifers to club root?]—*Tijdschr. PlZiekt.*, li, 4, pp. 117–119, 1945.

The most recent studies by Walker and collaborators in the United States [*R.A.M.*, xxiv, p. 260] appear to invalidate the conclusions reached by Rochlin in the U.S.S.R. [ibid., xiii, p. 140] and Heiling in Germany [ibid., xviii, p. 508] as to the favourable influence of a high mustard-oil content on the resistance of crucifers to club root (*Plasmodiophora brassicae*) [see next abstract].

Lackamp (J. W.). **Over den smaak van Stoppelknollen in verband met den weerstand tegen knolvoet.** [On the taste of Turnips in relation to resistance to club root.]—*Tijdschr. PlZiekt.*, liii, 2, pp. 49–54, 4 graphs, 1947. [English summary.]

The ammoniacal silver nitrate test for the determination of the mustard-oil content of turnips proved unreliable in the writer's experiments at the Plant Breeding Institute, Wageningen, and the resultant black coloration, moreover, gave no indication of sharpness of taste. No evidence was afforded by these studies of any correlation between this property, which is associated with a high mustard-oil content, and resistance to club root (*Plasmodiophora brassicae*) [see preceding abstract].

Giddings (N. J.). **Sugar Beet varieties in relation to curly-top virus strains.**—Abs. in *Sugar*, xlii, 4, p. 52, 1947.

In this paper, read at a meeting of the American Society of Sugar Beet Technologists in February, 1946, it is stated that the first studies on the sugar beet curly-top

virus strains were prompted by the variable results obtained from inoculations of the Old Type and S.L. 68 varieties [*R.A.M.*, xxv, p. 285]. Some strains of the virus were soon segregated and Old Type was shown to be equally susceptible to 1 and 3, whereas S.L. 68, while only moderately resistant to strain 1, was practically immune from 3. All the European and earlier American varieties tested were susceptible to both strains, only the later developed breeders' stocks from the Salt Lake City Laboratory, now released and coming into widespread use, being comparable with S.L. 68 in virtual immunity from strain 3. In these varieties extreme resistance to strain 3 is combined with a similar reaction to the destructive strains 5, 6, 8, and 9.

GREMMEN (J.). **Een bladvlekkenziekte bij Bonen veroorzaakt door Isariopsis griseola Sacc.** [A Bean leaf spot disease caused by *Isariopsis griseola* Sacc.].—*Tijdschr. PlZiekt.*, liii, 2, pp. 55–56, 1 fig., 1947. [English summary.]

At the Plant Breeding Institute, Wageningen, in September, 1946, the leaves of Beka brown beans [*Phaseolus vulgaris*] showed quadrangular, dark brown spots which, unlike those of *Colletotrichum lindemuthianum*, were not delimited by the veins. Microscopic examination of the under sides revealed the presence of masses of dark brown coremia, bearing elongated, often slightly curved, hyaline, bi- to quadricellular conidia, 50 to 75 by 7 to 8 μ. The fungus was identified as *Isariopsis griseola* [*R.A.M.*, xxv, p. 97], already reported from Holland by Schoevers in 1920 (*Tijdschr. PlZiekt.*, xxvi, p. 208): it would seem to be of little economic importance.

OGILVIE (L.). **The control of vegetable diseases.**—*Occ. Publ. hort. Educ. Ass.*, 5, pp. 63–67, 1947.

In these notes on vegetable diseases in Great Britain with special reference to their control by the use of clean seed, improved cultural methods, crop hygiene, and the development of resistant varieties [cf. *R.A.M.*, xxiv, p. 215], the author states that new strains of various disease organisms are now becoming adapted to various crops, e.g., the progressive type of *Verticillium* wilt of hops [*V. albo-atrum*: ibid., xxv, pp. 140, 141]. There is also the case of the strain of tomato leaf mould [*Cladosporium fulvum*] that attacks the Vetomold variety [cf. ibid., xxvi, p. 35]. The Roscoff broccoli strains, formerly resistant to *Mycosphaerella brassicicola*, are now susceptible. Strains of *Rhizoctonia* [*Corticium*] *solani* have recently been found on onions, peas, and other vegetable crops. In addition, diseases formerly fairly restricted are now widespread.

In order to secure healthier vegetables it is essential that the seed shall be cleaner than it is at present. Vegetable diseases commonly seed-borne [ibid., xxvi, p. 69] are listed. Also seed-transmitted but less commonly are ring spot of brassicas [*M. brassicicola*], lettuce ring spot [*Marssonina panattoniana*], and, occasionally, onion downy mildew [*Peronospora destructor*] and club root of brassicas [*Plasmodiophora brassicae*]. *Didymella* [*lycopersici*] on tomatoes [ibid., xxv, p. 371] and bean chocolate spot [*Botrytis cinerea*] are also seed-borne.

The 'picking over' process with peas and dwarf beans removes the seeds most heavily infected with fungi, but leaves too many that show no external symptoms. The best method is to grow the plants for seed in very dry areas, where diseases do not flourish [see below, p. 373]. Hickman, for example, working at Long Ashton found that of 29 samples of pea seeds grown in England 26 were infected, of which eight showed 20 per cent. or more infection, whereas only nine of 31 samples from Hungary, Morocco, and New Zealand were infected, only two of which showed over 5 per cent. disease.

A careful watch should be kept over nurseries where vegetable seed-stocks are grown. There have been several instances recently in the West of England of

diseases being distributed far and wide through such agencies. Long rotations, isolation of seed crops, suitability of locality, and the like are important.

Spraying is a practicable measure against some of the diseases [ibid., xxiii, p. 462]. Roguing of marrows with mosaic [cucumber mosaic virus] would save considerable losses among tomatoes, spinach, and celery and early roguing of greenhouse tomatoes is essential to keep down mosaic and streak [tobacco mosaic virus], *D. lycopersici*, *Verticillium* [*albo-atrum*], and *V.* [*dahliae*]. The policy of the Somerset War Agricultural Committee requiring the destruction of diseased Calla lilies [*Zantedeschia* sp.] has practically eliminated [tomato] spotted wilt from the local glasshouses.

D'Oliveira (Maria de L.). **O 'mosaico' de Faveira e suas relações com outras Leguminosas.** [The Broad Bean mosaic and its relations with other Leguminosae.]—*Brotéria*, xv, 2, pp. 90–94, 1946.

Ten minutes' exposure to temperatures of 50°, 60°, and 70° C. did not impair the pathogenicity of a strain of the mosaic virus isolated from broad beans [cf. *R.A.M.*, xviii, p. 224] at Tapida da Ajuda, Portugal, in 1937 and since maintained in culture; after the same period at 80° only half the inoculated plants contracted infection, while a temperature of 90° was lethal to the virus. The pathogenicity of the virus underwent no diminution on dilution with distilled water in proportions of 1 in 500 to 1 in 3,000. Only half the plants inoculated with the juice from diseased plants in dilutions of 1 in 4,000 reacted positively, and all those in the 1 in 5,000 and 1 in 6,000 series remained healthy. The virus was inactivated by treatment with 60 per cent. alcohol. Positive results were obtained in inoculation experiments on *Vicia faba* var. *minor*, garden and field peas, sweet peas, *Lathyrus latifolius*, and *Cicer arietinum*.

Löhnis (M[arie] P.). **Een voedingsziekte in Bonen (Phaseolus). Voorloopige mededeeling.** [A nutritional disease in Beans (*Phaseolus*). Preliminary report.] —*Tijdschr. PlZiekt.*, lii, 5–6, pp. 157–160, 1946. [English summary.]

Beans (*Phaseolus vulgaris*) in experimental plots at Wageningen supplied with little or no marl or given an ammonium sulphate amendment suffered each year from 1940 to 1944, inclusive, and again in 1946, from a disease characterized by interveinal chlorosis and later spotting and curling of the leaves, a brownish-purple spotting of the petioles and stems, generalized stunting of the plants, and poor development of the root system. The trouble may assume a severe form following wet weather, sometimes involving failure of the entire crop. The marl deficiency symptoms were further observed on sandy soil in the surrounding country, the foliage of the particularly susceptible dwarf French beans turning whitish-yellow and the plants remaining abnormally small.

There is some evidence that manganese toxicity may be the cause of the injury [cf. *R.A.M.*, xxii, p. 339]. The manganese content of diseased leaves was found greatly to exceed that of healthy ones. Plants grown in jars containing 300 gm. soil from affected plots develop the symptoms at an early stage unless forestalled by the addition of calcium carbonate (0·6 gm.), the beneficial effect of which is counteracted by a subsequent admixture of manganese sulphate (0·75 gm.).

Wilson (R. D.). **Rainfall in relation to the production of Bean seed free of the bacterial blight diseases.**—*Agric. Gaz. N.S.W.*, lviii, 1, pp. 15–20, 1 fig., 1947.

The most important seed-borne diseases of beans in New South Wales are halo blight (*Pseudomonas medicaginis* var. *phaseolicola*) [*R.A.M.*, xxiv, p. 172 and next abstract], which affects most varieties of dwarf French beans [*Phaseolus vulgaris*], and American common blight (*Xanthomonas phaseoli*) [ibid., xxv, p. 22] on Navy beans [*P. vulgaris*]. Mackie, Snyder, and Smith (*Bull. Calif. Agric. Exp. Sta.* 689,

1945) suggested that disease-free seed could be produced in areas having less than 1 in. rainfall in the growing season but there are no areas in New South Wales where the summer rainfall is low enough. Thus, consistent production of blight-free seed of susceptible varieties is not possible unless clean seed is used for the seed crop or thorough roguing is practised. Unless irrigation is adopted, a rainfall of about 10 in. during the four summer months is required in most parts of the State for the commercially profitable production of bean seed. The detection of trace infection of the bacterial blights and anthracnose (*Colletotrichum lindemuthianum*) [loc. cit.] is easier in high- than in low-rainfall areas, and the seed certification scheme [loc. cit.] introduced into New South Wales some years ago is easier to carry out in areas of high summer rainfall such as the south coast than it is elsewhere. The problem of obtaining clean seed of susceptible varieties is more likely to be solved in New South Wales by a certification scheme with zero tolerance for these three diseases than by any reliance on dry conditions to prevent spread.

WILSON (R. D.). **Soil carry-over of the Bean halo blight disease.**—*J. Aust. Inst. agric. Sci.*, xii, 3, pp. 103–107, 1946.

During field observations on the soil carry-over of the halo-blight organism *Pseudomonas medicaginis* var. *phaseolicola* [*R.A.M.*, xv, p. 765; xxvi, p. 41] a diseased bean crop (*Phaseolus vulgaris*) was ploughed in and the area replanted a week later with seed of the resistant Hawkesbury Wonder. The crop was slightly infected as it developed, but as all other crops from the same batch of seed remained healthy it is concluded that infection came from the ploughed-in material. The halo-blight organism was found to be viable in dry, sterile soil after 11 months under laboratory conditions.

The infective capacity of cultures of the halo-blight organism in beef extract-peptone broth was markedly reduced by the addition of a mixed culture from soil or bean seed infusion containing saprophytic organisms. Where broth cultures of the organism were added to autoclaved, dry soil which was then sown with disease-free seed of the susceptible variety Tweed Wonder, infection occurred in plants from sowings up to 125 days after adding the inoculum. No infection occurred when 68 days passed between the addition of the inoculum and the seed-sowing where the soil was watered twice a week until sown. When cut-up infected plants were incorporated in their own soil, infection occurred in the next crop from seed sown 22, 41, and 52 days after the inoculum was added but not when 64 days, 5 months, and from 5 to 18 months elapsed between the inoculation and seed sowing. The soil, therefore, is an unlikely source of the carry-over of the disease from one growing season to the next.

BOHN (G. W.) & MALOIT (J. C.). **The effects of carborundum in inoculating Bean plants with bacteria.**—*Phytopathology*, xxxvii, 3, pp. 196–198, 1 fig., 1947.

To investigate the action of 300-mesh carborundum in the inoculation of Black Valentine kidney beans (*Phaseolus vulgaris*) with *Pseudomonas* [*medicaginis* var.] *phaseolicola* and *Xanthomonas phaseoli*, both of which enter the leaves of this susceptible variety through the stomata, fully expanded primary leaves and first trifoliate leaflets were dusted with carborundum before rubbing with a pad soaked in a suspension of either organism. In another series the carborundum was omitted and the control plants were dusted and rubbed with a water-soaked pad. In the inoculations with *P.m.* var. *phaseolicola* one out of 30 dusted leaves and three out of 45 non-dusted ones were free from infection, the spots being considerably more numerous on the former. Two out of five leaves inoculated with *X. phaseoli* but not dusted escaped infection, while all the dusted ones developed acute symptoms. The water controls remained healthy.

The results of these experiments and those previously reported with bacterial spot of currant (*P. ribicola*) [*R.A.M.*, xxv, p. 349] indicate the utility of carborundum in tests with wound parasites and on hosts with hard, glabrous, thickly cutinized foliage.

Yu (T. F.). **Spotted wilt of Broad Bean.**—*Phytopathology*, xxxvii, 3, pp. 191–192, 1947.

Broad beans in the Chengtu district of Szechuan, China, sustained heavy damage in the winter of 1937 from a disease with the characteristic symptoms of the tomato spotted wilt virus, including a pronounced necrosis of the tops. The virus was collected from diseased beans and transmitted to young greenhouse tomato plants, extracts from which were rubbed on bean seedlings. Typical streak developed on a fair proportion of the plants, while young seedlings died within a fortnight of inoculation. On older plants the first symptoms consisted of spots about 1 mm. in diameter, rapidly expanding into oval or oblong lesions, 1 to 1·5 cm. long, with diffuse margins, later becoming zonate and darkening to black. The leaves curled slightly downwards or inwards along the tip or margin, finally shrivelling and collapsing, with the resultant top necrosis observed in the field. Infection subsequently spread to the lower leaves and killed the plants. Purplish-red, gradually blackening streaks of variable length were formed along the stems, which withered and dried. Infection of field plants after pod formation generally led to shrinkage and discoloration of the seeds, the coats of which bore black, necrotic spots. Normal seedlings were seldom produced.

The virus was readily transmitted by juice inoculations to tomato, tobacco, chilli, and *Zinnia elegans*, inducing the familiar bronzing of the foliage in the first-named. Its properties agree with those of the tomato spotted wilt virus, which was probably conveyed to the broad beans from neighbouring tomato fields through the agency of an insect vector.

Yu (T. F.). **Cercospora leaf spot of Broad Bean in China.**—*Phytopathology*, xxxvii, 3, pp. 174–179, 2 figs., 1947.

A leaf spot of broad beans due to *Cercospora fabae* [*R.A.M.*, xii, p. 263] is very prevalent in south-eastern China, but causes heavy damage in wet seasons only on the lower-lying rice land where bean-rice rotations are practised. Under such conditions the lower leaves decay and fall in the early spring, thereby arresting the normal development of the plant. The zonate lesions, mostly on the foliage, are oblong, circular, or irregular, averaging 5 to 7 mm. in diameter, with grey centres and chocolate to red raised margins. The diseased tissues may drop out, leaving shot holes. The occasional spots on the leaf petiole and stem are fusiform or oblong, with grey centres and deep red edges, almost indistinguishable from those produced by *Ascochyta fabae*. During wet seasons black lesions may often be found on these organs.

Greenhouse inoculations with conidial suspensions caused typical spots to appear on unwounded broad bean leaves but gave negative results on 14 other species and one variety of leguminous plants tested.

Overwintering is effected by means of conidiophores or stromatic mycelium on the dead leaves.

Yu (T. F.). **Ascochyta blight and leaf and pod spot of Broad Bean in China.**—*Phytopathology*, xxxvii, 4, pp. 207–214, 3 figs., 1947.

The species of *Ascochyta* causing heavy damage to the broad bean crop in Nanking, China, is in substantial symptomatological and morphological agreement with Sprague's and Rothschlag's descriptions of *A. pisi* on the same host in the United States and Germany, respectively [*R.A.M.*, ix, p. 273; x, p. 284]. The fungus was

shown by inoculation experiments to be unable to infect peas and other legumes, including *Vicia* spp., and from its strict specialization on broad bean would seem to be a distinct variety for which the name *A. pisi* var. *fabae* Sprague is proposed. The pycnidia, which occur at the centre or in circular zones on the spot, are globose-depressed, light brown, 95 to 270 by 111 to 301 μ in diameter with oblong, straight, or sometimes curved uni- or rarely bi- or tri-septate, 1·4 to 30·4 by 3·8 to 7·9 μ.

In 1934, diseased plants yielded less than half the normal crop in many parts of Kiangsu; for the next three years infection was prevalent but mostly slight along the Yangtze river. In 1940 a virulent outbreak occurred on higher ground near Chenkiang, Yunnan, causing losses of 80 to 100 per cent. of the stand. The fungus was shown experimentally to overwinter on dead stems and pods and also in the form of dormant mycelium in the seed coat, producing pycnidia when the seed begins to germinate in the spring.

HERINGA-WESTERHOF (A. C.). **Het vruchtvuur in de Komkommers veroorzaakt door Cladosporium cucumerinum Ellis et Arthur en zijn bestrijding.** [Cucumber gummosis caused by *Cladosporium cucumerinum* Ellis & Arthur and its control.]—*Tijdschr. PlZiekt.*, lii, 5–6, pp. 138–149, 2 diags., 1946. [English summary.]

Cucumber gummosis (*Cladosporium cucumerinum*) may be responsible for substantial damage in Holland [*R.A.M.*, xi, p. 690], where steps are seldom taken to combat the disease. No confirmation has yet been obtained of the opinion current among gardeners that wet weather favours the development of the fungus.

In the author's experiments in 1945 the pathogen grew best on sterilized potato slices. Inoculations on mature fruits (20 cm. or more in length) and the basal region of young ones (12 cm.) were invariably unsuccessful, the entry of the fungus being probably barred by the suberization of the outer and side walls of the epidermal cells.

With regard to control [ibid., xii, p. 485], *in vitro* tests showed the growth of *C. cucumerinum* on cucumber agar to be inhibited by shirlan at 0·0048 per cent., mercuric chloride (0·008), aretan (0·012), bulbosan (0·04) [ibid., xxii, p. 281], and an unnamed preparation (1) at 0·016 per cent. When the plants in 12 frames were dusted on 29th August, 1st, 6th, 17th, 22nd, and 27th September, and 4th October with bulbosan at dosages of 21, 10, 21, 10, 16, 12·5, and 9 gm. per frame, respectively, 49 out of 55 fruits were healthy and six slightly infected on 6th October. While bulbosan prevented the development of new infections, thereby ensuring a satisfactory late-season crop, it proved ineffectual against the extension of those already established before its application. Bulbosan (0·44, 0·125, and 0·444 per cent.) and mercuric chloride (0·25 and 0·125 per cent.) also gave promising results in soil-disinfection trials and might be of practical use in this capacity.

TRESCHOW (C.). **Champignondyrkning i Haver.** [Mushroom cultivation in gardens.] —*Friesia*, iii, 3, pp. 189–196, 2 figs., 1946. [English summary.]

Mushrooms can be grown out of doors in Denmark from June to November. The beds should be situated in the shade with some hours of morning and evening sunshine only. The cold frames used for cultivation should be 90 cm. in width, the wooden board on one side being 30 cm. in height and on the other 20 cm., a covering of asphalt paper on a wooden framework should be provided, and the frames must stand on firm ground, surrounded by a trench to drain off the rain. The horse manure used for composting should be procured about the middle of May. The process is completed in some 20 days. Two or three days after the compost has been placed in the frames, small pieces of mycelium are introduced into the layer in rows 25 cm. apart at intervals of 25 cm. The frame is then covered and the culture left untouched for about a month. When the whole mass, 10 cm. below the

surface, is interwoven with fine, white hyphae, the surface is copiously watered and the next day covered with a loose layer, 2 cm. thick, of loamy subsoil. The first mushrooms should appear after a fortnight or so and a yield of 10 kg. per sq. m. bed surface may be anticipated.

Infection by the destructive pathogen *Mycogone perniciosa* [*R.A.M.*, xxv, pp. 58, 94] may be avoided by the cultivation of *Psalliota bispora* var. *avellanea* or spraying with Bordeaux mixture 1–1–50 at the rate of 1 l. per sq. m.

SARASOLA (A. A.). **Enfermedades del Girasol.** [Sunflower diseases.]—[*Publ.*] *Dir. Agric., B. Aires*, 14 pp., 3 figs., 1942. [Received May, 1947.]

This pamphlet summarizes in popular terms the available information on the three principal diseases of the sunflower in Argentina, where the crop is stated to have acquired great importance of late years as a source of culinary oil: stem rot (*Sclerotinia sclerotiorum*), white rust (*Cystopus tragopogonis*) [*R.A.M.*, xxiii, p. 423], and powdery mildew (*Erysiphe cichoracearum*). Soriano has recorded the presence on sunflower of a virus of the mosaic type [ibid., xiii, p. 317]. *Sclerotium rolfsii* has been observed on the crop in Santa Fe, and Carrera has isolated *Fusarium javanicum* [ibid., xxvi, p. 207] from the collar region of the same host.

HADORN (C.). **Lässt sich eine Rotbrenner-Epidemie wirksam bekämpfen? Ergebnisse aus 4 Jahren Beobachtungen und Erfahrungen.** [Can a 'rotbrenner' epidemic be effectively controlled? Results of four years' observations and experiences.]—*Schweiz. Z. Obst- u. Weinbau*, lvi, 7, pp. 133–152, 3 diags., 5 graphs, 1947.

The writer's observations on the vine 'rotbrenner' (*Pseudopeziza tracheiphila*) epidemic in the canton of Grisons in 1943 have already been reported [*R.A.M.*, xxiii, p. 208]. The present contribution deals at length with further experiments on its control in the three succeeding years. The results of the 1944 trials confirmed previous experience as to the difficulties of effective control, even with the best fungicides available. The following year brought no solution of the problem, but the decisive importance of early (beginning mid-May), highly concentrated, and frequent sprays (at maximum intervals of a week) was again demonstrated. Copper-sandoz (0·5 per cent.) plus thiovit (1 per cent.), representing a combination of copper and sulphur in a particular form, gave very promising results in small-scale tests under controlled conditions.

The foliar discolorations induced by copper-sandoz alone in certain localities did not develop in the presence of thiovit, which is also effective against *Oidium* [*Uncinula necator*].

The following provisional recommendations for 'rotbrenner' control are made on the basis of observations made during recent years, notably in connexion with the 1946 trials. The physical and chemical properties of the soil should be improved by thorough tillage and manuring. The risk of infection starts with the first heavy showers in May and is renewed with every rainy spell until the second half of June. During this critical period the vines should be treated (1) when the first leaves attain a width of about 4 cm., before which, according to Müller-Thurgau (*Zbl. Bakt.*, Abt. 2, x, 1903; xxxviii, 1913), no infection is possible; (2) five to eight days later to coincide with the first anti-*Peronospora* [*Plasmopara viticola*] treatment; (3) after a further five to eight days, in any case before the blossom; (4) immediately after the blossom, paying special attention to the thorough wetting of the first buds; (5) further applications according to the local downy mildew schedule. For large-scale, practical tests in regions where the disease is rife the schedule planned for 1947 consisted in the main of 0·4 per cent. copper-sandoz plus 1 per cent. thiovit for all pre-blossom sprays; 0·4 per cent. copper-sandoz plus 0·75 per cent. thiovit

just after the blossom; and 0·4 copper-sandoz for further treatments. Pending the results of these trials, growers should continue to use 1·5 to 2 per cent. Bordeaux or 0·5 per cent. copper-sandoz at the times prescribed above [cf. *R.A.M.*, xxvi, pp. 185, 228].

HOUSTON (B. R.), ESAU (KATHERINE), & HEWITT (W. B.). **The mode of vector feeding and the tissues involved in the transmission of Pierce's disease virus in Grape and Alfalfa.**—*Phytopathology*, xxxvii, 4, pp. 247–254, 2 figs., 1947.

At the Experiment Station, University of California, Davis, feeding punctures of the following insects concerned in the transmission of the Pierce's disease virus in vine and lucerne [*R.A.M.*, xxvi, p. 42] were examined: adults of *Draeculacephala minerva, Helochara* sp., *Neokolla circellata,* and *Carneocephala fulgida,* and nymphs of *D. minerva* and *N. circellata.* All these insects were found to be seeking the xylem tissue in the course of feeding. In a representative batch of material comprising vine stems and leaves and California Common lucerne, 88·2 per cent. of a total of 110 punctures by *D. minerva* ended in the xylem, 2·7 per cent. reached the phloem, and 9·1 per cent. failed to traverse the parenchyma. Penetration of the mouth parts to reach the xylem appeared to be effected haphazard through the phloem or medullary ray, the passage being made either between or through the cells, including the tracheal elements. The presence or absence of the virus either in the vectors or in the host did not influence their mode of feeding. The feeding of viruliferous vectors on different parts of vine and lucerne stems showed that the virus could multiply and cause the disease only when the xylem tissue could be reached by the vector in the course of feeding. The rapid upward movement of the virus in lucerne stems suggests the possibility of its migration through the tracheal elements.

GAUDINEAU (MLLE M.) & DE SÈZE (R.). **Essais de lutte contre le mildiou et l'Oidium de la Vigne en 1943.** [Attempts to control Vine mildew and *Oidium* in 1943.]—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 65–78, 4 figs., 1944. [Received February, 1947.]

Second-degree trials with different preparations against vine mildew [*Plasmopara viticola*: *R.A.M.*, xxv, p. 488] carried out in 1943 at La Grande Ferrade led to the following conclusions. Intensity of defoliation was strikingly at variance with the apparent importance of leaf lesions. Spray materials low in copper appeared to keep the leaves free from infection, but did not prevent their premature fall. This was also observed in 1942, when, as in 1943, infection was light; should it occur in a year of heavy infection, a mixed treatment might be justified, in which copper would be used only when considered indispensable.

A product containing 15·3 per cent. copper as copper oxychloride and used at the rate of 100 gm. per hl. conferred good protection and is considered to merit further test, as does a 15 to 16 per cent. organo-zinc compound used at the rate of 1 per cent. The trials confirmed the view that cuprammonia mixtures can protect the foliage sufficiently during moderate outbreaks, but a concentration of 50 gm. copper per hl., double that used in 1942, was inadequate when only the number of spray applications advised by the Plant Protection Service was given, and it was found necessary either to use 100 gm. per hl. or to make a supplementary application. Bordeaux mixture 2 per cent. was superior to more dilute strengths.

Three applications of sublimated sulphur arrested infection by *Oidium* [*Uncinula necator*: ibid., xxv, p. 489, 490, xxvi, p. 4] and two applications of impregnated sulphurs (sulphur plus sodium carbonate or bentonite) kept the vines free. Colloidal sulphurs were also active against the same disease when the dosage was not too weak, but all except one, a suspension containing 50 per cent. sulphur and used at 0·5 kg. per hl., were definitely inferior to powdered sulphur. Abbé Dubaquié's copper polysulphide mixture gave encouraging results in its first year's trial.

Chamberlain (E. E.). **A list of plant virus diseases in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxviii, 4, pp. 234–237, 1946.

This is a tabulated list of 31 virus diseases in alphabetical order of their common names, following the usage of the *Review of Applied Mycology*, occurring on 66 hosts under field conditions in New Zealand, with references to the pertinent literature. The names used by K. M. Smith in his 'Text-Book of Plant Viruses' [*R.A.M.*, xvii, p. 52] are given whenever possible. The hosts are separately enumerated also in alphabetical order of their common names.

Thung (T. H.). **Antagonistische acties van viren. I.** [Antagonistic actions of viruses. I.]—*Tijdschr. PlZiekt.*, liii, 2, pp. 43–48, 1947. [English summary.]

The author's previous studies on the relative predominance of different viruses inoculated into the same plant are summarized [*R.A.M.*, xix, p. 241]. Later investigations have been concerned with the rates of propagation and multiplication of groundnut viruses, a paper on which is stated to be in the press. Since rapidity of multiplication may imply rapidity of propagation (rate of spread in the tissues) and predominance or strength, the question arises whether these properties are mutually dependent or independent, necessitating a comparison between the results of inoculation experiments and the following theoretical possibilities: two viruses are propagated at (*a*) an equal rate (P); (*b*) an unequal rate (p); two viruses are multiplied at (*c*) an equal rate (M); (*d*) an unequal rate (m); two viruses are (*e*) equal in strength (S); (*f*) unequal in strength (s). The following combinations may therefore result from the joint inoculation of two viruses into a single plant: PMS, PMs, Pms, pMS, pMs, pmS, and pms. If they are shown experimentally to be present, it may be assumed that the properties of propagation, multiplication, and strength occur independently.

Annual Report of the Massachusetts Agricultural Experiment Station for the fiscal year ending 30th June, 1946 (Bulletin 436).—70 pp., 1 fig., 1946.

This report [cf. *R.A.M.*, xxv, p. 333] contains the following items of phytopathological interest. In studying the Dutch elm disease problem M. A. McKenzie and A. V. Osmun report that up to 1st July, 1946, *Ceratostomella ulmi* [ibid., xxvi, p. 365] had been isolated from 182 trees in three counties although losses are not yet serious. Observations on the spread of the disease during the past five years show that it develops where conditions favour the carrier beetle [*Scolytus* and *Hylurgopinus rufipes*] population. The spread of the disease may be controlled by checking *C. ulmi* on weed elms and by timely disease control measures. The *Cephalosporium* wilt of elm [*Dothiorella ulmi*: ibid., xx, p. 608] was reported from three additional municipalities.

W. L. Doran found that, in the absence of fungicides, damping-off is much less severe if soils with a moisture content of about 30 per cent. of the water capacity at the time of seeding are not watered for four or five days afterwards. In tests of organic fungicides used with fertilizers for the control of damping-off, cabbage club root [*Plasmodiophora brassicae*: ibid., xxv, p. 148], and soil-borne onion diseases, the best results were gained with pyridyl mercurichloride or ethyl mercury phosphate in a limed soil. The yield of onions in soil infested with pink rot [*Fusarium vasinfectum* var. *zonatum* f. 1: ibid., xxv, p. 101] was substantially increased by applying thiosan at 70 lb. and fermate at 70 and 50 lb. per acre. Dithane, tuads (tetramethyl thiuramdisulphide), and phygon at 2·5, 0·6, and 0·45 gm. per sq. ft., applied with fertilizer to soil infested with *Pythium* spp., markedly improved stands of onion, cabbage, tomato, and beet. Similarly used, tuads, phygon, and dithane, respectively, improved [chilli] pepper, peas, and cress and dow seed protectant No. 9 at 0·45 gm. per sq. ft. improved cabbage, beet, and cucumber stands. There-

fore the use of fertilizer as a fungicide carrier in the quantities mentioned seems promising. The pre-emergence damping-off of *Lilium regale* seed was best controlled by pre-treatment with thiosan, arasan, or semesan.

W. L. Doran found that rooting of hemlock [*Tsuga canadensis*] cuttings taken in October and November was not improved by arasan after treatment with a root-inducing substance. American holly [*Ilex opaca*] cuttings rooted in larger percentages after treatment with indole-butyric acid alone than if followed by treatment with fermate or spergon. Spergon caused some injury to cuttings of Norway spruce [*Picea abies*] when used as a carrier of the acid and applied as a powder-dip, but fermate and arasan were harmless. Rooting of cuttings of hemlock, American arbor-vitae [*Thuja occidentalis*], and Chinese juniper [*Juniperus chinensis*] was improved by treatment with indole-butyric acid at 4 or 8 mg. per gm. fermate.

E. F. Guba in breeding tomatoes resistant to leaf mould (*Cladosporium fulvum*) [ibid., xxv, p. 334; xxvi, p. 35] released the four resistant types Improved Bay State, Improved Vetomold 121 [ibid., xxvi, p. 8], Leaf Mould Resistant Marglobe, and Leaf Mould Resistant Waltham Forcing for trial in autumn, 1945, of which the Marglobe hybrid is particularly promising. The four plants which derived resistance from No. 129,882 and the varieties Globelle, Vetomold, Vetomold 121, and Bay State are now completely susceptible. It is expected that the varieties now on trial which were developed from No. 112,215 will lose their resistance in time. Crosses between the Italian strain Prince Borghese, *L. peruvianum* [ibid., xxii, p. 502], which is highly resistant to *C. fulvum*, and Pan America strain No. 44 B 292 are being studied.

E. F. Guba found that spraying plots of Hubbard and Butternut squash [*Cucurbita* sp.] with Bordeaux 4–4–50 combined with 1 lb. calcium arsenate practically prevented *Mycosphaerella* [*citrullina*: ibid., xxv, p. 23], *Choanephora* [*cucurbitarum*: ibid., xix, p. 513], and *Alternaria* rots at harvest, the squash thus treated showing very little storage decay. Dipping butternut squash in wax-water-formaldehyde emulsion reduced shrinkage but did not control decay.

Fifty-eighth Annual Report of the Texas Agricultural Experiment Station, 1945.—76 pp., 84 figs., [? 1946. Received April, 1947.]

The following items are of interest in this report [cf. *R.A.M.*, xxv, p. 384]. The variety Sebago [ibid., xxiv, p. 31] has been selected as most resistant to late blight [*Phytophthora infestans*] of potatoes in the Lower Rio Grande Valley.

The follow-up procedure of using sodium hypochlorite at 0·75 per cent. in the final wash before drying, waxing, and packing added to the efficiency of decay control of citrus fruits [ibid., xxv, p. 212; xxvi, p. 148], brightened the fruit, and reduced still further the amount of blue mould [*Penicillium italicum*]. Diphenyl-impregnated tissue fruit wraps [ibid., xxvi, p. 53] also proved beneficial.

Hubam clover [*Melilotus alba* var. *annua*] in two-year rotation with cotton reduced damage from [Texas] root rot [*Phymatotrichum omnivorum*: ibid., xxv, p. 302] and increased yield. Increases in lint yield and decreases in root rot were also recorded when cotton followed a winter cover crop of hubam. The yellow annual clover, *M. indica*, is not so beneficial as hubam in this region.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1945–46*, Part I, pp. 166–202, 15 figs., 1946.

The following items are of phytopathological interest in this report [cf. *R.A.M.*, xxv, p. 543]. I. E. Melhus and C. S. Reddy report that Early Resistant Queen and Black Kleckley melons were increased in 1946 for seed-supply, the latter being very popular as an early variety with resistance to wilt [*Fusarium bulbigenum* var. *niveum*; ibid., xxv, p. 333] and anthracnose [*Colletotrichum lagenarium*].

Watermelon seed was planted at Conesville at 10-day intervals from 16th April, 1946. Very little seedling rot was observed before the beginning of May when there were 2·5 inches of rain and the soil temperature usually ranged from 12 to 15° C. During the first week of May there were several diseased seedlings in the second and third plantings, from most of which *Pythium irregulare* was isolated, and the fourth planting yielded both *P. irregulare* and *F. bulbigenum* var. *niveum*. Isolations after the first week of June were almost entirely of *Fusarium*. In seed-treatment tests with named fungicides [ibid., xxv, p. 24] preliminary results showed arasan to be at least as good as red cuprocide. Arasan, phygon, spergon, and red cuprocide increased the stand of the high and medium germinating seed by approximately 20 per cent. and up to 50 per cent. with poor seed.

H. C. MURPHY reports that although there was an excellent oats harvest in 1945 the reduction in yield from disease, the principal causal organisms of which were *Helminthosporium* and *Pythium* spp., amounted to 23·4 per cent. Clinton and some other Bond-hybrid selections were resistant to *H.* [*Pyrenophora*] *avenae* which was very prevalent in the seedling stage. *H. victoriae* [ibid., xxvi, p. 99 and below, p. 389] caused considerable damage but primary seedling infection was effectively controlled by seed treatment with new improved ceresan.

W. J. HOOKER, C. S. REDDY, and D. M. COE, in their propagation of disease-free sweet potato stock, report that in further tests incidence of stem rot [*Fusarium batatatis* and *F. hyperoxysporum*: ibid., xxiv, p. 306] in plants started either as slips or cuttings was about equal at the end of the 1945 season. These data are supported by preliminary results of 1946 tests. Dipping the fleshy roots in semesan bel or dithane before planting resulted in marked increase in slip production.

During tests to examine the influence of pythiaceous and other fungi on seedling stands of various crops led by I. E. MELHUS, W. F. BUCHHOLTZ, and H. C. MURPHY, *Pythium debaryanum* [ibid., xxv, p. 108] and *Fusarium* sp. were equally prevalent on the roots of young oat plants from mid-April to late May, 1945. *P. graminicola* occurred occasionally after 30th April. An attempt is being made to measure the effect of root necrosis on water utilization by cereals. Barley grown in soil infested with *P. graminicola* used only half as much soil moisture as, and had only half the top growth of plants grown in, steamed, uninfested soil. Soil-moisture utilization as measured by top length was similar at high and low soil moisture levels, but on a weight basis it was distinctly low at a low moisture level in infested soil. The maize relationships were similar to those of barley, but for oats the differences between plants in infested and non-infested soil were relatively smaller.

In replicated greenhouse experiments by H. C. MURPHY, C. S. REDDY, and I. J. JOHNSON, two isolates of *P. graminicola* [ibid., xx, p. 525], one of which was twice as virulent as the other, were used to inoculate 104 barley varieties and selections. Some of these were significantly less susceptible than others on the basis of average root length expressed as a percentage of non-infested checks. Wisconsin 38, Glabron, Velvon 8, Tregal, and Manchuria C.I. 4924 were among the most susceptible of the named varieties while Peatland, Pillsbury, Fond-du-Lac selections, and Purdue 21 winter barley were among the less susceptible. A bulked population of Wisconsin 38 obtained through field selection during the poor barley season of 1943 seemed significantly less susceptible to *P. graminicola* and higher yielding than non-selected seed increased from the 1942 crop. The chief drawbacks to successful barley production in Iowa are likely to be *Pythium*, *Helminthosporium*, and *Gibberella* diseases. Moderate resistance to the two last-named is shown by Manchuria and Chevron, respectively.

The antagonism of some species of Actinomycetes in relation to soil-inhabiting fungi was studied by C. H. MEREDITH and G. SEMENIUK. Of those isolated from Iowa soils 21 per cent. were antagonistic towards *P. graminicola* [ibid., xxv, p. 339; cf. xxvi, p. 216]. *Streptomyces* culture no. 211 was most promising for study

in connexion with this disease organism and work was therefore confined to this strain. It was grown on 1 per cent. maizemeal steep and after two weeks maize plants grown with *P. graminicola* in soil treated with the crude solution were taller and had longer roots than those in untreated soil. Plants grown without *P. graminicola* were improved by the addition of the crude solution. Maize grown for two weeks in soil treated with a solution inactivated by heating above 100° grew less than that treated with water or the crude solution. As spores of *Streptomyces* 211 did not control *P. graminicola* the crude and inactivated crude solutions were tested on Carrington, Marshall, and Grundy soils, two weeks later soil samples being added to agar plates. The mean growth measurements of fungi appearing naturally on the plates were: (*a*) crude solution 1·75 cm., (*b*) water 2·19 cm., and (*c*) inactivated crude solution 2·23 cm. On the same media *P. graminicola* grew well in the absence of crude solution but showed no growth in its presence. In comparison with the effects of certain fungicides and antibiotics the active principle was found to be less toxic to *P. graminicola* than mercuric chloride but as toxic as copper sulphate; a concentration of 1 per cent. of the crude solution in the medium or 1 part of its dried residue in 100,000 parts of medium inhibited growth.

In experiments on the control of potato scab [*Actinomyces scabies*] in highly calcareous peat and muck soils [ibid., xxvi, p. 77] in north Iowa by W. J. Hooker, W. F. Buchholtz, and A. T. Erwin, Cobbler and Sebago seed was planted from 27th April to 3rd July at roughly two-week intervals. With both varieties scab incidence was progressively reduced as planting was delayed. During greenhouse inoculation tests varieties resistant to tuber scab were also resistant to stem necrosis caused by *A. scabies*. Present host range studies indicate that under certain conditions many plants not hitherto known to be hosts of the pathogen may be attacked. Of several plants used in tests, growth was markedly reduced only by parasitic strains of *A. scabies*. The same four parasitic and six non-parasitic cultures previously used were tested in the laboratory for their ability to parasitize potato stems. There was a positive correlation between the ability of a culture to reduce seedling root growth, to cause stem necrosis, and produce scab on tubers.

A study of the causal relationship and control of the oak wilt fungus (*Chalara quercina*) was made by S. M. Deitz. Epiphytotics appearing all over the State were most severe in north-eastern Iowa, particularly on red [*Quercus borealis*], black [*Q. velutina*], white [*Q. alba*], Hill's [*Q. ellipsoidalis*], and burr [*Q. macrocarpa*] oaks. Infection of red oaks under field conditions progressed from the top of the tree downwards. Spread usually took place from one dominant tree as the initial point of infection to other dominant and subdominant trees in concentric zones. The rate of spread within red oaks was much faster than in white and burr oaks. The wilt symptoms [ibid., xxiv, p. 80] spread much more rapidly in red oak than did the organism. The field symptoms varied with the species, the season of infection, and stage of maturity of the host. Symptoms varied under field and greenhouse conditions. The following were shown by inoculation to be susceptible; *Q. bicolor*, *Q. montana*, *Q. muehlenbergii*, *Q. rubra*, *Q. rubra* var. *pagodaefolia*, and *Q. shumardii*. *C. quercina* commonly overwinters on burr and white oak and occasionally on red oak, especially when infection takes place in late September or October.

A. W. Welch superintended a study on pod and stem blight of soy-beans caused by *Diaporthe sojae* [ibid., xxv, p. 332] of which the ascigerous stage has been reported only in culture. It occurred naturally on old stems which had wintered in the field. Stems collected during March and stored in moist chambers produced mature perithecia in 17 days. The immersed perithecia had long, tapering beaks, 347 to 521 by 94·8 to 158 μ. The sessile, elongate, clavate asci contained eight bicellular ascospores, each 10·4 to 18·5 by 3·5 to 5·5 μ. The ascospores germinated in two to five hours in tap-water. The best medium for pycnidial formation was sterilized

soy-bean seed coats in a moist chamber, on which pycnidia appeared in abundance in approximately two weeks.

KULESCHA (Z.). **Comparaison entre l'action du Phytomonas tumefaciens et celle de l'acide indole-acétique sur les fragments de parenchyme vasculaire de Topinambour cultivés in vitro.** [Comparison between the action of *Phytomonas tumefaciens* and that of indole-acetic acid on fragments of vascular parenchyma of Jerusalem Artichoke cultivated *in vitro*.]—*C.R. Soc. Biol., Paris*, cxli, 5–6, pp. 232–234, 1947.

In further studies on tumour formation by *Phytomonas* [*Bacterium*] *tumefaciens* in vascular fragments of Jerusalem artichoke [*Helianthus tuberosus*] cultivated *in vitro* [*R.A.M.*, xxvi, p. 289], no difference could be detected between the excrescences caused by the organism itself, those developing at a distance from the original focus of infection, and those resulting from the action of indole-acetic acid.

BRAUN (A. C.). **Thermal studies on the factors responsible for tumor initiation in crown gall.**—*Amer. J. Bot.*, xxxiv, 4, pp. 234–240, 4 figs., 1947.

It was shown by Riker and collaborators, in their comparative studies on the physiology of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) and related organisms [*R.A.M.*, xxi, p. 130], that a profound change in the physiology of either the host, the pathogen, or possibly both, occurs between 28° and 31° C. This observation suggested a useful line of approach to further investigations of the conditions under which the factors responsible for tumour initiation in crown gall become physiologically active in the conversion of normal to tumour cells. The results here reported are concerned with this phase of the crown-gall problem.

A temperature of 32°, just above the critical point for tumour formation in the periwinkle (*Vinca rosea*) [ibid., xxiii, p. 128], prevented the transformation of normal into diseased cells, but exerted no inhibitory effect on the factors inducing multiplication after the consummation of the cellular changes. It was further shown that the failure of the bacteria to effect the cellular conversion did not result from physiological disturbances in the plant as a whole but depended on the environmental conditions prevailing round the site of inoculation. The gross wound-healing response of the plants held at 32° did not differ materially from that of those maintained at 26°, nor did the former temperature exert a demonstrable bacteriostatic action on the organisms in the host tissues. Several possible explanations of these observations are discussed.

The period during which the active principle must be sought has been greatly restricted. The first evidence of cellular alteration was detected after a one- to two-day exposure of the plant tissues to the bacteria, which can only induce this effect, moreover, during the four-day period immediately following injury to the host. The process of conversion of normal into tumour cells being completely arrested by a temperature of 32°, a method is now available for the study of crown-gall inception in the great majority of plants unable to tolerate a high thermal range for sufficiently long periods to kill the pathogen.

ELROD (R. P.) & BRAUN (A. C.). **Serological studies of the genus Xanthomonas. I. Cross-agglutination relationships. II. Xanthomonas translucens group.**—*J. Bact.*, liii, 5, pp. 509–524, 1947.

Hyperimmune sera were prepared in rabbits for 36 species and subspecies of *Xanthomonas* [*R.A.M.*, xxv, p. 300]. Elimination of the mucoid exudate resulted in cellular antigens which reacted more specifically on cross-agglutination than gummy suspensions. By this means it was possible to demonstrate the existence

of five compact immunological groups, of which three, *vasculorum*, *phaseoli*, and *campestris*, were related through the last-named, while the *translucens* and *pruni* groups were associated to some extent through the antiserum of the latter. Each group manifested a high degree of serological homogeneity.

Comprised in the *X. vasculorum* group, besides *X. vasculorum* itself, are *X. vesicatoria* and its var. *raphani*, *X. hederae*, *X. incanae*, *X. papavericola*, *X. campestris* var. *armoraciae*, and *X. taraxaci*. The *X. campestris* group, consisting of the organism named and *X. barbareae*, reacts reciprocally with all the above-mentioned species. Another group, related to the *campestris* pair but not to the *vasculorum* block, includes *X. phaseoli* and its var. *fuscans*, *X. geranii*, *X. pelargonii*, and *X. malvacearum*. Members of the *X. translucens* group form the largest serological block, which embraces all available species and subspecies of *X. translucens*, *X. maculifolium-gardeniae* [ibid., xxvi, p. 109], *X. cucurbitae*, *X. carotae*, *X. juglandis*, and *X. begoniae*. The *X. pruni* group is composed of the organism named, *X. corylina*, *X. phaseoli* var. *sojense*, and *X. lespedezae*, the heterologous interactions between which are frequently so strong as to equal the homologous titre. The serological affinities of six species, viz., *X. holcicola*, *X. vignicola*, *X. gummisudans*, *X. manihotis*, *X. hyacinthi*, and *X. rubrilineans*, were not sufficiently distinctive to permit of their assignment to any of the differential categories. The systematic position of the three last-named is doubtful.

With the aid of absorbed antisera the numbers of the *X. translucens* group were divided into four serological subgroups. *X. juglandis* and *X. carotae* were each placed in an immunologically distinct subgroup, a third (*cucurbitae*) consisted of *X. cucurbitae*, *X. begoniae*, and four strains of *X. translucens*, one f.sp. *hordei* and three f.sp. *hordei-avenae*, while a fourth (*cerealis*) [ibid., xxv, p. 553] accommodated *X. maculifolium-gardeniae*, one strain of *X. translucens* f.sp. *hordei*, three isolates of f.sp. *undulosa*, and nine of f.sp. *cerealis*. All the organisms comprising the fourth subgroup of *X. translucens* agglutinate in unabsorbed *X. pruni* antiserum.

Reciprocal absorption tests between the organisms in each of the subgroups demonstrated their homogeneity.

DALE (W. T.). **Witches' broom disease investigations. XII. Further studies on the infection of Cacao pods by Marasmius perniciosus Stahel.**—*Trop. Agriculture, Trin.*, xxiii, 12, pp. 217–221, 6 figs., 1946.

This is a further investigation [cf. *R.A.M.*, xxiv, p. 52] into *Marasmius perniciosus* attacking cacao pods in Trinidad [ibid., xxvi, p. 97]. The method of obtaining spores and the inoculation technique previously described [ibid., xxii, p. 242] were used. The seven types of pod infection following inoculation were (*a*) indirectly infected pods on diseased flower cushions having a systemic invasion of the fungus: the ovules do not develop; (*b*) invading mycelium causing hard, carrot-shaped pods and eventual necrosis, beans all small and infected; (*c*) local infections causing asymmetrical pods which become hard and turn dark brown, the beans being completely destroyed; (*d*) larger pods become hard and turn dark brown when ripe but retain their normal shape with a proportion of undamaged beans only in the largest pods; (*e*) necrotic speckling of the inner or outer layers of rind or both, usually in larger fruits only, the beans remaining undamaged if the pods are harvested promptly; (*f*) young infected fruits may succumb to 'cherelle wilt', a physiological disorder [ibid. xxii, p. 293], the fungus areas surviving the remaining tissue for a short while; (*g*) the rind may be rotted by *Colletotrichum* spp., *Botryodiplodia theobromae*, or *Phytophthora palmivora* in addition to *M. perniciosus*. The fruits used in the experiments were Brazilian pods of the Forastero variety Maranhao and those of the Trinidad I.C.S. 1 clonal selection. Large pods were mostly used with smaller ones inoculated for comparison. A decrease in the severity of pod

symptoms was apparent as the size at which the young fruits became infected increased. Multiple infections were the cause of extensive damage after the inoculation of larger pods. The results indicated that the pods of both varieties became more resistant to witches' broom disease as they grew larger, but up to 6·9 cm. there was no sign of changing susceptibility with increasing size and both varieties were equally susceptible to artificial infection. Pods of I.C.S. 1 up to 13·9 cm. and those of Maranhao up to 8·9 cm. were successfully inoculated, some larger pods developing infections confined to the shell. Pods larger than this were apparently immune. The average inoculation periods for pod infection varied from 80 to 90 days, a comparison with healthy controls showing that infection tended to cause premature ripening. This is more marked with the badly diseased pods which had been infected when comparatively small. Where witches' broom is very prevalent in Trinidad there are serious losses from December to March when the pods are picked. The tabulated results indicate that the infections most often begin during the period favourable to sporophore production, September to December. There is a possibility that pods might be protected economically from infection if the position is re-examined. The young pods in particular could be protected easily by the use of a simple sprayer covering a large area in a relatively short space of time, thus reducing mature pod losses.

Posnette (A. F.). **Use of seeds in the insect transmission of some plant viruses.**—*Nature, Lond.*, clix, 4041, pp. 500–501, 1947.

An improved technique for the insect transmission of the viruses causing cacao swollen shoot [*R.A.M.*, xxvi, p. 97] is described. The bean is taken from the ripe pod, the testa removed, and one cotyledon dissected away to expose the convoluted surface of the other. Insects fed on an infected plant are brushed on to the bean placed in a solid or 'block' watch-glass. Humidity can be maintained by means of a square of damp filter paper under the cover of the watch-glass. When the desired feeding time has elapsed, the insects are killed with nicotine solution. The beans are then planted in sterilized sand in an insect-proof house. Germination remains unaffected, and symptoms generally develop in the first or second (occasionally in the third) pair of foliage leaves. The vectors successfully used were *Pseudococcus citri*, *P. njalensis*, and *Ferrisia virgata*.

The method can also be used for testing suspected vectors found in natural outbreaks of virus diseases occurring in localities remote from the laboratory. Peeled cacao beans are planted in damp sterilized sand in specimen tubes of suitable size, the mouth sealed with muslin held by a rubber band. Germination begins immediately and a seedling can be kept in each tube for about a fortnight before transplanting. Suspected vectors are transferred from infected plants to the cotyledons on which they are allowed to feed until a return is made to the laboratory. They are then removed, and the seedling is planted. In this manner, virus transmissions were carried out in swollen shoot areas in the Ivory Coast, the infected plants being established in the Gold Coast after a tour of 1,400 miles lasting 17 days.

Buttress (F. A.) & Dennis (R. W. G.). **The early history of cereal seed treatment in England.**—*Agric. Hist.*, xxi, 2, pp. 93–103, 1947.

In this short, interesting review of the early history of cereal seed treatment in England the authors refer to the work of Olivier de Serres (1600) and to the writings of Francis Bacon (Sylva Sylvarum, 1628), and then show how brining and liming were introduced. Mention is made of other practices advocated by various seventeenth- and eighteenth-century writers, and the paper concludes with a brief discussion of the possible value of these early methods [cf. *R.A.M.*, xxvi, p. 307].

JOHNSON (T.). **Recent changes in the physiologic races of certain of the cereal rusts.** —Abs. in *Proc. Canad. phytopath. Soc., 1946*, 14, pp. 13–14, 1946.

During the last ten years considerable changes have occurred in the physiologic races of certain cereal rusts [in Canada: *R.A.M.*, xxv, p. 387; xxvi, p. 49]. Of wheat stem [black] rust (*Puccinia graminis tritici*), race 56 [ibid., xxv, p. 335] is still predominant. Race 17 [loc. cit.], infrequent before 1940, became common in that year, and remains so. Race 15 B [see below, p. 388] has not been found in Canada; a further spread of this race would have serious consequences, as it is able to attack the Renown, Regent, and Thatcher wheat varieties.

Races of oat black rust (*P. graminis avenae*) [ibid., xxiii, pp. 173, 433; xxiv, p. 356] other than 1, 2, and 5 were seldom found between 1921 and 1942. The problem of breeding for resistance was mainly a matter of developing varieties resistant to these three, and this was done by producing the Anthony and Vanguard oats. Occasionally, race 7 was collected which attacked Anthony, race 8 which attacked Vanguard, and race 6 which infected both. In 1943, race 8 became rather common, and since then it has no longer been possible to regard the Vanguard, Ajax, Vicland, and Talma varieties as resistant [ibid., xxvi, p. 8].

Fifteen races of oat crown rust (*P. coronata avenae*) [ibid., xxiv, pp. 144, 186] have been found in Canada. In eastern Canada, races 2 and 3 were predominant for some years. The resistance of Erban in that area was due to the fact that it shows adult-plant resistance to both; when, as in 1945, race 5 became widely prevalent, Erban reacted as a susceptible variety [ibid., xxvi, p. 8]. The susceptibility of this variety in the prairie provinces is due to the fact that it does not develop adult-plant resistance to races 1 and 4, which are common there.

The reasons for these changes in the distribution of the physiologic races of cereal rusts are discussed, and it is concluded that given a certain degree of distribution, a certain amount of overwintering, and susceptible hosts, then a new strain of rust is likely to become permanently established.

ATKINS (I. M.), HANSING (E. D.), & BEVER (W. M.). **Reaction of varieties and strains of winter Wheat to loose smut.**—*J. Amer. Soc. Agron.*, xxxix, 5, pp. 363–377, 1947.

At one or more of the Kansas and Illinois Agricultural Experiment Stations, and Texas Substation, Denton, 238 varieties and strains of winter wheat have been tested for resistance to loose smut (*Ustilago tritici*) by artificial inoculation in one or more years since 1937 [*R.A.M.*, xxii, p. 294]. Pawnee proved to be the only resistant variety of commercial hard red winter wheat, remaining entirely free from infection in seven years' trials in Texas and showing only a trace in five years in Kansas and 1 per cent. in one year in Illinois, where the most virulent races of the smut were used. Kanred × Hope (C.I. 11976) and Hope × Turkey (C.I. 11964), which are resistant to leaf [brown] and stem [black] rusts (*Puccinia triticina* and *P. graminis*) contracted only slight infection in two seasons in Texas, while a group of unnamed Kawvale–Marquillo × Kawvale–Tenmarq strains were highly resistant in Kansas; many of these react similarly to the rusts and Hessian fly (*Phytophaga destructor*) [ibid., xx, p. 107].

The most uniformly resistant of the 117 soft red winter wheats tested were Currell, Kawvale (semi-hard), Leap, Thorne, and Trumbull, while a number of Mediterranean × Hope strains, including the Austin variety, which are likewise resistant to the rusts, gave very encouraging results in Texas.

All the above-mentioned varieties and selections of both classes of wheat yield valuable parental material for breeding purposes. Differences in varietal reaction at the several stations indicate the presence of a mixture of physiologic races in the inocula and emphasize the need for caution in the transference of infected seed from one area to another to avoid the introduction of new physiologic races into regions hitherto free from them.

CARRERA (C. J. M.) & MENASE DE GIBERTI (MARIA J.). **Pruebas experimentales realizadas con Fusarium graminearum Schw.** [Experimental tests performed with *Fusarium graminearum* Schw.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iii, 25, 7 pp., 1947.

The reactions of the wheat varieties Sinvalocho, 38 M.A., Klein Amalia Klein, Benvenuto, Inca, and La Previsíon to inoculation with 17 isolates of *Fusarium graminearum* [*Gibberella zeae*] from Pergamino and Rafaela, Argentina, are presented in tabular form. The maximum incidence of infection (25 to 100 per cent.) was induced by strain No. 17, isolated from 38 M.A. Rafaela, and the minimum (0 to 40) by No. 8 from Guatraché M.A.

NEWTON (MARGARET) & CHEREWICK (W. J.). **Erysiphe graminis in Canada.**—*Canad. J. Res.*, Sect. C, xxv, 2, pp. 73–93, 1947.

Wheat, oats, barley, rye, and many grasses in Canada are affected by powdery mildew (*Erysiphe graminis*) [*R.A.M.*, xxiii, p. 291; xxvi, p. 151]. It was recorded every year from 1921 to 1945 with the possible exception of 1924 when no survey was made. In British Columbia, in 1936, the damage from *E. graminis* on the wheat variety Little Club was estimated to be 87 per cent. and on Bond oats 20 per cent. According to reports from Ontario and Quebec, mildew is the most destructive barley disease locally, winter wheat varieties also being badly attacked. Sometimes barley and wheat are badly affected by mildew in certain areas in the Prairie Provinces where oat mildew has not been recorded.

Nine physiologic races of *E.g. hordei* and three of *E.g. tritici* have now been isolated in Canada. In the identification of these races the barley and wheat varieties used were the same as those of Mains *et al.* [ibid., ix, p. 643; xii, p. 362; xvi, p. 376] with the addition of Chevron C.I. 1111. An analytical key is given for the identification of the physiologic races of *E.g. hordei* on the basis of their pathogenicity on six selected differential varieties of barley. Between 1940 and 1945 five new races were identified of which four, 8, 9, 11, and 12, attacked Chevron. These four races, comprising 50 per cent. of the isolates during that period, threaten new barley varieties with resistance of the Chevron type. The prevalent Canadian races are 3, 6, 8, and 9. Races 2, 5, and 7 identified in the United States have not been found in Canada.

Until 1943, only one physiologic race of *E.g. tritici*, attacking the wheat varieties Huron and Chul, had been identified. It was isolated in Manitoba. Three new races identified in Canada and differing from the two described by Mains are tentatively numbered 3, 4, and 5 (Canada). A key for the identification of the five races is given. A study was made of the relative resistance of strains and varieties of barley and wheat to physiologic races of *E. graminis*, the tests being made in the greenhouse. As all the resistant varieties detected by the authors were found to be resistant to mildew in both the seedling and the adult stages, the selection of resistant varieties on the basis of seedling tests should be possible. However, some varieties did not react identically in both stages to powdery mildew, some being more resistant in the adult stage. As higher temperatures tend to increase resistance [ibid., xxiii, p. 292] temperatures were kept down as far as possible during the tests. Tables are given of the infection types [based on a scale ranging from 0 immune to 4 very susceptible] on 246 barley varieties, strains, and species inoculated in the seedling stage with races 1, 3, 4, 6, 8, 9, 10, 11, and 12 of *E.g. hordei* and on 124 wheat varieties, strains, and species inoculated in the same stage with races 4 and 5 of *E.g. tritici*. It was found that some varieties of both cereals are highly resistant to all known Canadian races. Of *Hordeum vulgare* 44 varieties, including 16 Duplex hybrids, are immune or highly resistant to the Canadian races of barley mildew. Of *H. distichon* and *H. deficiens*, respectively, nine and three varieties

possess the same high resistance to all the races. Of the *Triticum vulgare* wheats tested, Chul (R.L. 543), Hope (R.L. 209), H–44–24 (R.L. 229), and most varieties and strains derived from crosses having Hope or H–44–24 as one parent, showed very high resistance to the two races employed in these tests. Only one variety of *T. durum*, Belaturka (R.L. 1443), showed high resistance to both races in the seedling stage, but Gaza (R.L. 1664), Mindum (R.L. 568), and Pentad (R.L. 203), although susceptible in the seedling stage, developed resistance in the adult stage. The tested varieties of *T. dicoccum*, *T. monococcum*, and *T. timopheevi* [ibid., xix, p. 206] all proved resistant to both races in the seedling stage. All hybrids of the highly resistant parent, Duplex (C.A.N. 1129), proved very resistant to all the known Canadian races of *E.g. hordei*; Pasknon (C.A.N. 34) [ibid., xxiv, p. 224] and Minsturdy (C.A.N. 732) are also reported resistant to the United States races. The three recently developed hard spring wheat varieties, Coronation (R.L. 729), Regent (R.L. 975), and Redman (R.L. 1884), are resistant to the Canadian races of *E.g. tritici* known at present.

DETROUX (L.). **Recherches sur le piétin-verse (Cercosporella herpotrichoides Fron).** [Researches on foot rot and lodging (*Cercosporella herpotrichoides* Fron).]—*Parasitica*, ii, 1, pp. 1–13, 1 pl., 1946.

After stating that Belgian farmers suffer heavy loss as a result of foot rot and lodging of wheat caused by *Cercosporella herpotrichoides* [*R.A.M.*, xxv, pp. 301, 444; xxvi, p. 50], and pointing out that the best method of control probably lies in developing resistant varieties, the author describes a series of experiments to determine the conditions favouring maximum infection.

In the first experiment, Professor Delos wheat was grown in water-tight zinc pots in a container into which a stream of cold water at about 14° C. was directed, pieces of infected wheat stalks being placed on the seeds when sown. No difference in the degree of infection was observed between the experimental plants and controls grown at 20°.

In a second experiment, pots of wheat seedlings grown at 20° were exposed to temperatures of 7° or 0° for 48 hours, or −10° for 24 hours, inoculations being made at sowing and again after the exposures. The different temperatures had no effect on the degree of infection that finally resulted.

In a third experiment, plants grown in sand in Petri dish covers were exposed to the same changes of temperature as in the second experiment and after chilling the seedlings were inoculated and then placed in a saturated atmosphere. The temperature changes had no effect on the degree of infection but infection was more severe than in experiments one and two.

In a fourth experiment designed to ascertain the environmental conditions resulting in optimum infection, Professor Delos and Picardie wheat was sown on 4th and 5th February in pots which were kept at 20° until emergence on the 14th after which some of the pots were placed in a greenhouse at 20° and the remainder in an unheated greenhouse; some pots in each series were kept at saturation point. In each series inoculations were effected at sowing or on emergence, or on both dates. Examinations of the sheaths showed that microsclerotial plaques developed first on the plants kept at 20° in a saturated atmosphere and inoculated at emergence or both at sowing and emergence, but later on infection became general and was the same in all pots. Measurements of the diameter of the base of 50 uninfected and 50 infected seedlings averaged 3·04 and 1·99 mm., respectively, for Professor Delos wheat and 2·48 and 1·63 for Picardie.

When Professor Delos seedlings (generally considered highly susceptible), l'Institut de Gembloux (moderately resistant), and Jubilé (resistant) were grown on sand in Petri covers, inoculated on emergence, and kept in humid conditions, all three varieties became equally affected. Of 15 varieties grown in pots, inoculated

at sowing and one month later and kept in humid conditions, most appeared to be highly susceptible and none as resistant as Picardie.

Field experiments showed that both early sowing in autumn and early infection favoured severity of attack. With spring sowing infection was much reduced.

Replies to a questionnaire sent out to farmers indicated that early sowings (end of September and early October) favour intensity of attack. The disease is very intense when wheat follows barley or wheat. Infection is more severe in low-lying areas, damp places, and hillsides exposed to the rain than elsewhere. Manuring does not appear to have an important effect. On the whole the replies suggested that deep sowing favours attack. Almost all the varieties grown by the different farmers appeared to be susceptible. Of 24 specimens of stubble examined, 19 showed the presence of *C. herpotrichoides*, 7 of *Leptosphaeria herpotrichoides*, 3 of *Ophiobolus graminis*, and 2 of *Wojnowicia graminis*.

ALFARO (A.). **El Ácaro Pediculopsis graminum Reut. y el hongo Nigrospora oryzae (Berk. et Br.) Petch, en asociación parasitaria sobre Tigos aragoneses.** [The Acarid *Pediculopsis graminum* Reut. and the fungus *Nigrospora oryzae* (Berk. & Br.) Petch in parasitic association on Aragonese Wheat.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xvi, pp. 321–334, 12 figs., 1946.

A disease of wheat in the province of Aragon, Spain, attributed to the joint intervention of the mite *Pediculopsis graminum* and *Nigrospora oryzae*, developed in dry patches at the end of May, 1945. At this time none of the ears had emerged from the last leaves, which were still enveloped in their sheaths and twisted at the base, first to the right and then to the left, with a resultant reduction of 20 per cent. of the crop in some plots. The spikelets were killed in the incipient stage of development. Within the leaf enclosing the ear and on its basal node were some whitish hyphae with an abundance of black conidia, among which diminutive mites were swarming. The globose, whitish masses situated between the disorganized spikelets, and especially near the basal node, were found to be gravid females of *P. graminum*, from which legions of fresh mites proceeded.

Inoculation experiments on potted wheat plants with suspensions of conidia collected in the autumn gave negative results, except for a few cases in which mites were added, but those carried out with the fungus in the spring were successful.

The association between *P. graminum* and *N. oryzae* aggravates the damage inflicted by either partner alone. The non-gravid females transport the conidia of the pathogen in their abdominal sacs, while the mite in its turn feeds on the fungus and the decomposed host tissues, though quite capable of maintaining itself unaided on the ears.

LEJEUNE (A. J.). **A note on the reaction of certain Barley varieties to race 15 B of stem rust (Puccinia graminis tritici Erikss. and Henn.).**—*Sci. Agric.*, xxvii, 4, pp. 183–185, 1947.

During 1946, 28 named barley varieties and 41 hybrids were tested for susceptibility to race 15 B [*R.A.M.*, xxiv, p. 142] of stem [black] rust [*Puccinia graminis tritici*; ibid., xxvi, p. 49] in Winnipeg. The infection percentages on the susceptible varieties were 70 for race 15 B and 80 for the other races used. The reaction of all varieties to race 15 B and the other races was essentially identical, the normally resistant varieties, Peatland and Chevron, being resistant, and the normally susceptible varieties highly infected in both cases. Regent, Renown, and Thatcher, however, normally resistant to the common races, were severely infected with 15 B. Of the 41 hybrids tested, 35 of Peatland parentage were selected for resistance to the races of black rust other than 15 B.

In view of these results, barley-breeding programmes including resistance to black rust need not be interrupted in order to add resistance to race 15 B if Peatland

or Chevron or possibly the other known resistant varieties are being used as the source of resistance.

POEHLMAN (J. M.). **Sources of resistance to loose smut, Ustilago nuda, in winter Barleys.**—*J. Amer. Soc. Agron.*, xxxix, 5, pp. 430–437, 1947.

This is a tabulated report of the responses of 65 winter barleys to artificial inoculation with loose smut (*Ustilago nuda*) over a four-year period (1943–46) in Missouri [*R.A.M.*, xxv, p. 30]. Not more than two of the 42 awned varieties (which included rough and smooth selections of the Tennessee winter type, foreign introductions, and selections from composite crosses) were resistant, namely, Kentucky 6 and Bulgarian, and these were only tested in two years. Of 23 hooded types, 17 were resistant, all springing from one of the Tennessee Beardless varieties or Missouri Early Beardless [ibid., xxvi, p. 101].

LUDWIG (R. A.). **Health condition of Quebec grown Oat and Barley seed samples.**—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 18–20 [? 1947].

Of 45 samples of oat seed grown in 1942 in widely scattered parts of western Quebec, 16 showed no smut [*Ustilago avenae* and *U. kolleri*] spores per seed, 5 showed a trace to 500, 5 showed 501 to 1,000, 5 showed 1,001 to 2,000, 6 showed 2,001 to 5,000, 2 showed 5,001 to 10,000, 3 showed 10,001 to 20,000, and 3 showed over 20,000. Two other pathogens carried by the seed were *Helminthosporium* [*Pyrenophora*] *avenae* [see next page] and *Fusarium* sp. Of 46 samples, 5 showed no infection by *P. avenae*, 15 showed a trace to 10 per cent., 12 showed 11 to 20, 6 showed 21 to 30, 3 showed 31 to 40, 2 showed 41 to 50, and 3 showed 51 to 60 per cent. No *Fusarium* infection was present in 18 of the samples, a trace to 10 per cent. was found in 26 samples, and 11 to 20 per cent. occurred in 2 samples.

To ascertain the effect of infection by *P. avenae* on germination a test was carried out at low soil temperature using untreated and ceresan-treated seed. Of the untreated seed, only 17 of 39 samples gave a germination of 90 per cent. or over, and of these 17 only 3 gave a stand with 90 per cent. or more healthy plants. In contrast to this, 29 of the 39 samples when treated with ceresan gave over 90 per cent. germination, and of these, 26 gave over 90 per cent. healthy plants. Taking these results as a whole, it appears that 5 per cent. of the samples could safely be planted untreated, 90 per cent. would be improved by treatment, and 5 per cent. would be worthless even if treated.

Only 15 samples of barley were tested. Of these, 7 showed no infection by *H. teres*, 7 showed no *H. sativum*, and 6 no *Fusarium* sp.; 5 showed a trace to 10 per cent. *H. teres*, 5 the same of *H. sativum*, and 9 the same of *Fusarium* sp.; 3 showed 11 to 50 per cent. *H. teres*, and 3 showed 11 to 50 per cent. *H. sativum*.

These results demonstrate that treatment of cereal seed is generally necessary in Quebec, where a cereal seed-testing service would be of definite value to farmers.

KINGSOLVER (C. H.). **New Oat disease increases importance of seed treatment.**—*Circ. Mo. agric. Exp. Sta.* 312, 4 pp., 3 figs., 1947.

During 1946, although excellent growing conditions had prevailed and a very good crop was obtained generally, individual farmers in Missouri reported cases of premature dying, excessive lodging, and, occasionally, failure to head in oats, due to *Helminthosporium victoriae* [see above, p. 380], a disease new to this crop locally. This condition, which takes the form of a blight and a severe root rot, may cause pre-emergence damping off.

The disease was first recorded at Ames, Iowa, in 1944. In 1946, it was reported from parts of the oat belt from the Rocky Mountains to the Atlantic. Reports from all these areas record such very heavy losses that it is likely that varieties

susceptible to the new disease, even though resistant to others, will decline in popularity.

All the new oat varieties which have Victoria as a parent are susceptible, including Boone, Tama, Control, Vicland, Cedar, Forvic, Vikota, Osage, and Neosho. Such varieties are planted on about one-third of the oat acreage in Missouri, chiefly in the north-west; the principal variety grown in the other sections is Columbia, susceptible to both rusts [*Puccinia coronata* and *P. graminis*] and smuts [*Ustilago avenae* and *U. kolleri*] but resistant to the new disease. Other new oats, including Clinton, carry resistance to the rusts and smuts as well as to *H. victoriae*.

Seed treatment with new improved ceresan ($\frac{1}{2}$ oz. per bush.) gives partial control.

LEBLOND (D.). **Résultats d'observations préliminaires sur l'effet comparé de la formaline et du ceresan contre les maladies des grains de semence des céréales.** [The results of preliminary observations on the comparative effect of formalin and ceresan on cereal seed diseases.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 60–61 [? 1947].

A field at St. Vallier de Bellechasse, Quebec, was sown with oat seed, untreated, treated with formalin, and treated with ceresan. When the plants were 6 to 8 in. high it was found that infection mainly due to *Helminthosporium* [*Pyrenophora*] *avenae* [*R.A.M.*, xxv, pp. 256, 296 and preceding page] averaged 10·7, 4·2, and 1 per cent., respectively, for the three lots. Germination tests in the laboratory gave 90 per cent. germination for the untreated seed and 94 per cent. for the treated, whether formalin- or ceresan-treated, but germination was less vigorous in the former owing to the presence of moulds, mainly *Alternaria*, *Penicillium*, and *Cephalothecium* [*Trichothecium*]. The untreated, formalin-treated, and ceresan-treated seed showed, respectively, 74, 34, and 0 per cent. moulds.

As regards smut [*Ustilago avenae* and *U. kolleri*: ibid., xxvi, p. 196], there were about 40,000 spores per grain, which when sown untreated yielded about 50 per cent. smutted panicles, though only traces were found on the plants from the treated seed. The three treatments gave, respectively, on the harvested seed 129,000, 4,000, and 450 smut spores per seed, while germination was, respectively, 80, 84, and 89 per cent. and weight was slightly in favour of the ceresan-treated seed.

CHOWDHURY (S.). **A Gibberella blight of Rye hitherto unrecorded from India.**—*Curr. Sci.*, xvi, 5, pp. 152–153, 3 figs., 1947.

A severe blight of rye ears was observed for the first time at the Upper Shillong Farm, Assam, in August, 1946. The blight may attack the heads at any point, usually affecting one spikelet, but may later spread to others. The first indication of infection consists of water-soaked areas, the glumes being slightly brown, which later dry out and appear ripened. If the infection spreads into the radius at the base of the spikelet and completely girdles it, the head above will dry up and die. After some time a slightly pink, later salmon, cottony fungus growth appears on the dead surface. In the diseased heads the grains are frequently affected, resulting in light-weight, shrivelled kernels. The fungus was identified as *Gibberella saubinetii* [*G. zeae*] and its occurrence reported for the first time in India. A specimen has been placed in the Herb. Crypt. Ind. Orient., Imperial Agricultural Research Institute, New Delhi.

BROWN (A. M.). **Abnormal colour in sclerotia of ergot, Claviceps purpurea (Fries) Tul.**—Abs. in *Proc. Canad. phytopath. Soc., 1946*, 14, p. 14, 1946.

On 27th July, 1943, three pale buff ergot sclerotia (*Claviceps purpurea*) were collected from winter rye in the field. A tissue culture made from one was inoculated into different lots of rye plants in the greenhouse in 1944 and 1945, and abnormally coloured sclerotia were consistently produced. After stratification in moist sand

for two months at a temperature a little above freezing, some of these sclerotia were removed to room temperature; ten days later, several fructified and liberated ascospores. Ten single-ascospore cultures were secured, each from a separate sclerotium, and these were used to inoculate rye in the greenhouse. The plants inoculated with three of the cultures gave abnormally coloured sclerotia, while those inoculated with the remaining seven produced normally coloured sclerotia. These results indicate that the abnormally coloured ergot, when completing its life-cycle, segregated for colour.

Stoll (A.) & Brack (A.). **Über die Entstehung von Sklerotien des Mutterkornpilzes (Claviceps purpurea) an den obersten Halmknoten des Roggens.** [On the development of sclerotia of the ergot fungus (*Claviceps purpurea*) on the uppermost haulm nodes of Rye.]—*Ber. schweiz. bot. Ges.*, liv, pp. 252–254, 4 pl., 1944. [Received July, 1947.]

It has generally been assumed that the formation of true ergot (*Claviceps purpurea*) sclerotia is restricted to the primordia of the ovary in the ears of Gramineae, but in the course of mechanical inoculations with a conidial suspension of the fungus on a growing rye crop in Switzerland [*R.A.M.*, xxv, p. 65] the haulm nodes were occasionally punctured and sclerotia developed on those near the top of the stem. Further attempts to induce sclerotial formation by the systematic inoculation of the nodes gave negative results until in a new series of tests the ears were bent over, interrupting the flow of sap to the floral rudiments; this led to the typical production of honeydew, followed by sclerotia. The honeydew did not appear until about a month after the inoculation of the nodes as against 10 to 14 days in the case of ear infection immediately before flowering.

The sclerotia arising from the nodes contain the same specific, highly active ergot alkaloids as those developing on the ears. For instance, colorimetric determinations of three nodal sclerotia gave contents of 0·264, 0·169, and 0·134 per cent. ergotamin as compared with an average of 0·3 per cent. for those produced in the normal manner. The main difference between the sclerotia from the two locations lies in their shape, those formed on the nodes being irregular and deeply cleft, while those from the ears are perfectly regular.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1945–46*, Part II, pp. 49–52 [? 1947].

I. E. Melhus and G. Semeniuk [cf. *R.A.M.*, xxv, p. 555], using their method of inoculating maize plants with *Ustilago zeae* [*U. maydis*: ibid., xxv, p. 96], found that out of 70 specimens from the Corn Belt, 48 south-western 'Indian' corns, and 77 collections from Mexico [ibid., xxv, p. 72] and Guatemala, three collections from Mexico and 11 from Guatemala appeared to possess some resistance.

A study of the nature of disease resistance in maize and methods of measuring was made by G. Semeniuk, W. E. Loomis, C. S. Reddy, E. W. Lindstrom, and G. F. Sprague using maize rust (*Puccinia sorghi*) [*P. maydis*], which was more prevalent in Iowa in 1945 than in the preceding years, causing most damage to inbred lines. Greenhouse experiments with over 100 inbred lines and 50 single crosses of U.S. dent maize showed all to have marked susceptibility in the seedling stage. The relationship between field susceptibility and seedling susceptibility in the greenhouse appears to be obscure. A brief description is given of a phyllody and witches' broom development in field-grown hybrid maize noted in 1945 in low-lying wet areas of Iowa. Some plants were stunted, others abnormally tall with twice the normal number of leaves and extra leafy shoots, while normal-sized plants showed stimulated axillary shoot development and phyllody.

I. E. Melhus, G. Semeniuk, C. S. Reddy, and J. R. Wallin carried out a search from July, 1945 to May, 1946 for resistance to maize root necrosis [*Pythium*

graminicola: ibid., xxiv, p. 54; xxv, p. 544, and above, p. 381]. About 1,400 lots of native and exotic maize were tested in 36 trials, using a pathogenic isolate of the fungus from the seedling roots of maize grown near Kelly, Iowa, in 1944. Comparable lots of inoculum of the same age were used for infesting the soil, two inbreds R4 and Hy of known reaction to *P. graminicola* being included in each trial. Twenty-one days after planting the seedling roots were washed and the severity of the parasite measured according to reduction in seedling height and the amount of necrosis and root development. The susceptibility varied widely with each lot and those resistant to *P. graminicola* are undergoing further tests at the Tropical Research Centre, Guatemala. The optimum temperature for the disease was 15° C. The amount of root necrosis was directly influenced by the time lapse between soil infestation and planting of the seed. When steamed soil was allowed a lapse of several days before infestation, necrosis was markedly reduced. Observations in various parts of Guatemala revealed that there was little or no root necrosis of plants up to 2 ft. tall.

BUTLER (F. C.). **Ear, cob, and grain rots of Maize.**—*Agric. Gaz. N.S.W.*, lviii, 3, pp. 144–151, 20 figs., 1947.

To assist diagnosis in the field and to provide a guide to the selection of disease-free maize grain for seed purposes, descriptions are given of cob rots found in New South Wales. *Gibberella moniliformis* [*G. fujikuroi*] and *G. fujikuroi* var. *subglutinans* [*R.A.M.*, xv, pp. 280, 359] are commonly responsible for rotting of individual grains or localized areas on the cob. Only occasionally do they cause any general rotting of the tissues. A streaking and bleaching of the grain, from the tip towards the dent end, sometimes indicates internal infection by *G. fujikuroi*, but may be due to infection by *Cephalosporium acremonium* [cf. ibid., xvi, p. 168] or other fungi. Severe internal infection, particularly by *G. fujikuroi* var. *subglutinans*, is often shown by a reddish-purple discoloration in germinating grains.

G. saubinetii [*G. zeae*: ibid., xv, pp. 280, 359] generally causes an extensive generalized cob rot extending for some distance from the tip. Occasionally it causes a butt-end rot, and sometimes the whole ear may be rotted.

Dry rot caused by *Diplodia zeae* [ibid., xv, p. 280] sets up a progressive general rotting of the ear from either the tip or butt-end of the cob.

Cob rot due to *Basisporium gallarum* [*Nigrospora oryzae*: ibid., xi, p. 222; xxiii, p. 383] is easily recognized by the black-speckled bases of the grains, and black bundle disease due to *C. acremonium* by the reddish or purplish colour at the 'dough' stage, and the blackening of the vascular bundles. *Penicillium* species [cf. ibid., xxiii, p. 480; xxiv, p. 225] seldom cause extensive rotting in uninjured maize when the cobs and grain are in active growth, but if the cobs are allowed to remain too long on the stalk in moist weather, or if the ears are dried under poorly ventilated conditions, infection may occur especially at the tip-end.

Aspergillus niger [cf. ibid., xxiv, p. 54] causes a black mould on the ear which often follows insect attack in moist seasons. *A. flavus* [cf. ibid., xxiii, p. 333] causes a yellow mould on the ear. Species of *Penicillium* and *Aspergillus*, together with other moulds, are also found on germinating maize grain, on stored grain, and even on grain still on the cob in the field. Attack in the field generally follows injury by birds or insects to the grain. Other fungi associated with such infections include species of *Rhizopus*, *Alternaria*, *Acrostalagmus*, *Trichoderma*, and *Cephalothecium* [*Trichothecium*]. In addition, species of *Mucor*, *Torula*, *Monilia* [? *Candida*], *Hormodendrum*, and *Sporotrichum* may occur on the grains. They impair germination and may cause considerable injury, or even result in the death of the young developing shoots or roots.

The control measures recommended [ibid., xvii, p. 656; xx, p. 558] consist in the careful selection of clean, healthy seed both in the field and the barn, improved

cultural practices, and (as a routine measure) seed-dusting with an organic mercury compound at the rate of 2 oz. per bush.

HAYES (H. K.), RINKE (E. H.), & TSIANG (Y. S.). **Experimental study of convergent improvement and backcrossing in Corn.**—*Tech. Bull. Minn. agric. Exp. Sta.* 172, 40 pp., 8 figs., 1946.

Details are given of a study of convergent improvement in maize carried out in Minnesota, in the course of which from the back-cross programme of (B 164×37) B 164, where B 164 is an inbred susceptible to smut [*Ustilago zeae*] and 37 is smut-resistant, it was possible to obtain improved lines resembling B 164 which were somewhat highly smut-resistant.

GOIDÀNICH (G.) & SCARDOVI (V.). **Esperienze sulla suscettibilità al 'carbone della cariosside'—prodotto da Sphacelotheca sorghi (Link) Clinton—di alcuni Sorghi zuccherini coltivati in Italia.** [Experiments on the susceptibility to covered smut—caused by *Sphacelotheca sorghi* (Link) Clinton—of certain sweet Sorghum varieties cultivated in Italy.]—*Agricoltura ital.*, xlvi (1° N.S.), pp. 243–260, 1 pl., 1946.

This is an expanded account of a paper on sorghum covered smut (*Sphacelotheca sorghi*) already noticed from another source [*R.A.M.*, xxvi, p. 197].

VENKATARAYAN (S. V.). **Diseases of Ragi (Eleusine coracana).**—*Mysore agric. J.*, xxiv, 2, pp. 50–57, 1946.

A brief account is given of the occurrence of the following diseases of *Eleusine coracana* in India, summarized from the pertinent literature: leaf blight and foot rot (*Helminthosporium nodulosum*) [*R.A.M.*, xiv, p. 439; cf. also xvii, p. 699], blast (*Piricularia* sp.) [ibid., xxi, p. 363], smut (*Ustilago eleusinis*) [ibid., iii, p. 571], mustiness in storage (*Heterosporium* sp.), green-ear disease (*Sclerospora* sp.), wilt (*Sclerotium rolfsii*) [ibid., xii, p. 267], mosaic-type mottling [ibid., xxvi, p. 12], leaf spots (*Cercosporella* sp. and *Acrothecium lunatum*), the former reported by Narasimhan in *Rep. Dep. Agric. Mysore*, 1920–1, and the latter by Butler & Bisby [*R.A.M.*, xi, p. 545] and one or two disorders of undetermined etiology, possibly connected with adverse soil factors.

LIN (K. H.). **Observations on Citrus diseases in China.**—*Plant Dis. Reptr*, xxxi, 3, pp. 107–111, 1947. [Mimeographed.]

During 1941 and 1943 evidence was found of 20 citrus diseases, 12 of major importance, in the Chinese provinces of Fukien, Kiangsi, and Szechuan. Scab (*Elsinoe fawcettii*) [*R.A.M.*, xxiv, p. 441] is most severe on tangerine, *Citrus poonensis*, and grapefruit, particularly in older closely planted orchards in Fukien, and on *C. kinokuni* in Kiangsi. Canker (*Phytomonas* [*Xanthomonas*] *citri*) is most prevalent on sweet orange, lemon, and *C. tankan* in Fukien. A bark disease suspected by the author to be related to psorosis, but considered by H. S. Fawcett to be similar to bark rot or to Florida gummosis [ibid., xi, p. 365], is common in Fukien and commonly attacks older tangerine trees. In some orchards over 50 per cent. of the trees are affected. Decline, which affects mostly trees under 12 years old, appears to be due to improper water relations in the soil and is sometimes aggravated by lack of fertilizers. It is most serious in Fukien and is the limiting factor in the growing of *C. poonensis* in South China. Convex gum, a new disease already reported [ibid., xxii, p. 384], causes considerable damage in Fukien to nursery trees of sweet orange only and young orchards of Kushanchow Kan oranges. Greasy spot is common in Fukien and Kiangsi on sweet orange and grapefruit and causes considerable damage to susceptible species in South China. Sooty mould (*Meliola*

sp.) is most prevalent in Fukien on tangerine, grapefruit, and sweet orange and to a lesser degree on sweet orange in Kiangsi. Blue and green moulds (*Penicillium italicum* and *P. digitatum*) occur mainly in Fukien, but the blue mould is common everywhere [see next abstract]. Black spot (*Phoma citricarpa*) [ibid., xxii, p. 430] is serious in Fukien only, on *C. poonensis*. Brown rot gummosis caused by *Phytophthora* spp. was confined to Fukien, where it was serious in several sweet orange orchards. *Diplodia* gummosis [*D. natalensis*] caused damage in a tangerine orchard in Szechuan.

Among the disorders of minor importance were magnesium deficiency of sweet orange in Fukien and Kiangsi, melanose (*Diaporthe citri*) on sweet orange in all three provinces, and oleocellosis [also known as 'goosefleshʼ: ibid., xvi, p. 94, xix, p. 86, *et passim*] in Fukien on orange and lemon and in Szechuan on orange.

HWANG (L.), CHOW (C. M.), & CHING (I.). **Further study on storage experiments of Kwangsi Sha-Tien Pummelo (Citrus grandis Osbeck) with special reference to disease control.**—*Kwangsi Agric.*, vi, pp. 12–25, 2 graphs, 1946. [Chinese, with English summary.]

Blue mould (*Penicillium italicum*) [see preceding abstract] was the major cause of spoilage in stored grapefruit in the authors' experiments, being responsible for 79 per cent. of the total incidence of infection at the end of 217 days. Next in importance (in the order named) came *Phomopsis* stem-end rot (*Diaporthe citri*), anthracnose (*Colletotrichum gloeosporioides*), *Diplodia* stem-end rot (*D. natalensis*), *Fusarium* sp., and green mould (*P. digitatum*). The best control, especially of blue mould, was secured by five minutes' immersion of the fruit in a 6 per cent. borax solution [cf. *R.A.M.*, xiii, p. 763; xvi, p. 744], wrapping in copper-impregnated tung-oil paper, and packing in earthenware jars. Almost equally effective, notably against *D. natalensis* and *Diaporthe citri*, was a dip in a 4 per cent. mixture of sodium and potassium carbonate, followed by packing in earthenware jars. Fruit packed with fresh pine needles in earthenware jars, with or without chemical treatment, showed the least loss in weight. *C. gloeosporioides* was not amenable to control by these methods.

CALAVAN (E. C.). **Shell bark of Lemons.**—*Calif. Citrogr.*, xxxii, 6, pp. 232–233, 263–265, 16 figs., 3 diags., 1947.

Shell bark attacks most Eureka lemon plantings over 16 years old in California and has also been observed frequently on six-year-old trees near the coast. No United States variety appears to be immune. Since 1921 it has been believed that the disease is caused by *Diaporthe citri* [*R.A.M.*, xxv, p. 558] but this is now very doubtful. Several studies were recently made on shell-bark lesions and bark thickness at Riverside [ibid., xxiv, p. 97] and Corona. Sections cut through primary lesions in Eureka lemon bark revealed that the necrotic areas originate in the middle bark rather than at the bark surface or in wounds and these lesions contain no fungi. Old lesions contained several fungi but with no species consistently present. Some secondary fungi often found in 'active' lesions include *Alternaria citri* and other *A.* spp., *Botryosphaeria ribis*, *Botrytis cinerea*, *Colletotrichum gloeosporioides*, *D. citri*, and *Diplodia* and *Fusarium* spp. Wound inoculations with these fungi resulted only in gumming lesions, but it is thought that they all may accelerate the extension of shell bark lesions. Lemon bark rarely shows signs of shelling before it is 4 mm. thick and in the early stages the south-east side of the trunk where the bark is thickest is usually the first to shell. Owing to the non-fungal nature of the primary lesions fungicides are of no use in controlling the disorder. Breeding and selection may check shell bark in the future but meanwhile care should be taken in the choice of parent trees to reduce its premature appearance.

Knight (R. L.). **The genetics of blackarm resistance. V. Dwarf-bunched and its relationship to B_1.**—*J. Genet.*, xlviii, 1, pp. 43–50, 1 pl., 1947.

During the course of breeding American Upland cotton (*Gossypium hirsutum*) for resistance to blackarm [*Xanthomonas malvacearum*: cf. *R.A.M.*, xxiii, p. 341; xxvi, p. 200], the F_2 generation of a cross between Uganda B31 and 514 included a number of dwarfed plants with abnormally short internodes. This 'dwarf bunched' character is due to two recessive genes *da* and *db*. Dwarf-bunched was shown to be closely linked to the blackarm-resistance gene B_1 and it is thought that *da* may possibly be identical with B_1. The use of B_1 within the *C. hirsutum* group, therefore, may result in the production of this dwarf-bunched type. This would not occur with *G. barbadense* which carries the two normal dominant genes *Da* and *Db*.

Groszman (A.). **Cinco anos de melhoramento de Algodão pelo Departamento de Genética, Estatistica e Biometria da Escola Superior de Agricultura do Estado de Minas Gerais—Vicosa.** [Five years of Cotton improvement by the Department of Genetics, Statistics, and Biometry of the Higher School of Agriculture in the State of Minas Gerais—Vicosa.]—*Ceres*, v, 26, pp. 94–115, 5 pl., 4 figs., 1 diag., 1943. [English summary. Received June, 1947.]

Reference is made to a collection of 13 species of *Gossypium* and a large collection of cotton varieties maintained by the Department of Genetics. Two hybrids of *G. barbadense* and *G. hirsutum* were resistant in tests for reaction to *Verticillium albo-atrum* [*R.A.M.*, xxiii, p. 333]. In the F_2 of a cross between Texas Green Lint and Virescent, an entirely new leaf colour described as 'ferrugem' (rust) has appeared, and further studies on its inheritance are to be made. There is a description of the system of seed production and distribution.

Garrett (S. D.). **Report on an investigation of Verticillium wilt.**—*Emp. Cott. Gr. Rev.*, xxiv, 2, pp. 101–102, 1947.

This is the final report on four years' investigation into *Verticillium* wilt [*V. albo-atrum*: cf. *R.A.M.*, xxiv, p. 449] of cotton carried out from April, 1940, to March, 1944, at Rothamsted Experimental Station. The prospects for controlling *Verticillium* wilt are poor because its mode of spreading is typical of a vascular parasite, the transmission from diseased to healthy roots being by root contact although an infected plant does not become infectious to its neighbours until the penultimate phase when the fungus develops on the outside of the root. Soil conditions can only influence the progress of the disease indirectly by influencing the susceptibility of the plant. Infection is favoured by a high level of nutrition in the host plant, especially by nitrogen and by conditions favouring photosynthesis and growth. Manurial treatment is therefore useless in combating the disease [ibid., xxiii, p. 154]. Although this view is supported by other investigators who say that *Verticillium* wilt is more prevalent on soils well supplied with organic matter, it has yet to be confirmed in Uganda. Breeding and selection of wilt-resistant varieties offers the only prospect of control.

De Vasconcelos (A. T.) & De Oliveira (B.). **Nota acerca de 'Saprolegnia' parasitica Coker e da acção de certos sais sobre o seu desenvolvimento.** [Note on *Saprolegnia parasitica* Coker and on the action of certain salts on its development.]—*Brotéria*, xvi, 1–2, pp. 15–19, 2 figs., 1947.

Saprolegnia parasitica was reported by Da Camara *et al.* in 1936 [*R.A.M.*, xvi, p. 563] as a parasite of *Carassus auratus* in Portugal, where it has since been observed from time to time, an outbreak of major importance having occurred among carp (*Cyprinus carpio*) in the Lisbon Colonial Garden in 1939. Other species affected in

different parts of the country include *Gasterosteus aculeatus*, on an isolate from which the present study was conducted. Chlamydospores were found in profusion on Dox's and maize meal agar, and zoospores in a liquid medium only [cf. ibid., xviii, p. 799]. The growth of the fungus was inhibited by the addition to Dox's liquid medium of calcium chloride or sodium borate at 0·25 per cent. Inoculation experiments on *Carassus auratus* gave negative results.

Borges (Maria De L. V.). **Uma doença do Linho nova para Portugal.** [A Flax disease new to Portugal.]—*Brotéria*, xv, 3, pp. 129–136, 1 map, 1946.

The 'pasmo' disease of flax (*Sphaerella linorum*) was observed for the first time in Portugal in 1941 at the National Agronomic Station, Sacavém. The fungus was isolated in pure culture on several standard media, of which Dox's proved to be the most suitable, with an optimum growth temperature of 25° C. There were no appreciable differences in the reaction to inoculation with *S. linorum* of a number of indigenous and foreign flax varieties. The first symptoms appeared on the leaves and stems on the 11th and 21st days, respectively, after infection, while pycnidia were not observed until the 28th. The disease was shown to be seed-borne and was not effectively combated by ten minutes' immersion in a 1 per cent. mercuric chloride solution.

Payette (A.) & Lachance (R. O.). **Désinfection superficielle de la graine de Lin en vue de l'analyse biologique.** [Surface disinfection of Flax seed for biological analysis.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 101–104, [? 1947].

Preliminary experiments on the surface disinfection against *Fusarium lini*, *Colletotrichum lini* [*C. linicola*], *Alternaria* sp., and bacteria generally [*R.A.M.*, xxiii, p. 487] of flax seed intended for biological analysis (degree of infection by different organisms, etc.), indicated that on the whole the most suitable method, in comparison with cuprocide dusting and mercuric chloride solution, was a one-minute steep in a 10 per cent. solution of calcium hypochlorite.

Lachance (R. O.) & Payette (A.). **Efficacité relative de divers fongicides contre l'anthracnose du Lin.** [Comparative efficacy of various fungicides against Flax anthracnose.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 105–109, [? 1947].

Preliminary laboratory and greenhouse tests carried out in Quebec on the control of *Colletotrichum lini* [*C. linicola*] by seed treatments [*R.A.M.*, xxvi, p. 55 and preceding abstract] showed that all the disinfectants used increased emergence by about 20 per cent. The best control as measured by the percentage of anthracnose on 12- to 14-day old seedlings was given by ceresan, followed by arasan, and then by spergon. Semesan was about as effective as spergon, while semesan jr. was not effective. The optimum dosage was 2 oz. per minot [1 minot = 39 l.] in every case. With ceresan, $1\frac{1}{2}$ oz. per minot gave as good control as 2 oz. of arasan.

When healthy flax seed was sown in soil experimentally inoculated with *C. linicola* ceresan again gave the best seed protection, the optimum dosage being 2 oz. per minot. Spergon and semesan jr. gave some protection, but arasan and semesan were not satisfactory. Further work is in progress.

Wilson (Irene M.). **Observations on wilt disease of Flax.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 221–231, 1 pl., 6 graphs, 1946.

During 1942, work was begun at Aberystwyth on the effects of seed treatments for the prevention of seed-borne diseases of oil varieties of flax [cf. *R.A.M.*, xxiv, p. 58]. The fungicides used were nomersan and agrosan G, applied in fine powder form at the rate of 0·6 per cent., while the flax varieties sown, on an experimental

scale, were La Plata (regional strains from Argentina) and Bison and Redwing (uniform, carefully selected seed from Canada). Sowing was carried out on 20th May. Two seed-borne fungi caused serious trouble, *Polyspora lini* and *Fusarium lini* [cf. ibid., xxvi, p. 56]. Before the end of the third week after sowing, many seedlings were in a dying condition as a result of wilt due to *F. lini*, the symptoms agreeing with those described by Millikan [ibid., xxiv, p. 505]. All the varieties became affected, those most severely attacked being Redwing and La Plata.

When isolates of *F. lini* from the original seed of Redwing and from parts of diseased plants were used to infect pots of steam-sterilized soil in which healthy La Plata seed was sown, all the plants (kept at 23° to 24° C.) developed wilt and died in 20 to 37 days, the fungus being re-isolated from the dead seedlings.

Untreated Redwing plants produced seed heavily infected with *P. lini* and in a laboratory test with 400 seeds nomersan [ibid., xxii, p. 358] reduced infection from 55 to 2 per cent., while agrosan G suppressed it completely. On Bison seed, nomersan reduced *F. lini* infection from 14 to 3 per cent., and agrosan G to 1 per cent.

In 1944, La Plata seed free from all seed-borne pathogens except about 0·5 per cent. of *P. lini* was treated with nomersan or agrosan G or left untreated, and sown on 7th May in a plot where a crop heavily infected with *F. lini* had been grown the year before, the diseased seed used for this crop also having carried *P. lini*. During the 1944 season disease due to *P. lini* did not become conspicuous until the crop was ripening. Wilt due to *F. lini*, on the other hand, caused severe damage. Germination was about 30 per cent. in the treated seed and 13 per cent. in the untreated, as against 95 per cent. in a neighbouring bed of similar soil free from *F. lini*. The higher yield from the treated seed was entirely due to the greater stand. High mortality from wilt coincided with dry, sunny periods. Heaviest destruction occurred in the very early stages of germination, and a further conspicuous fall in the number of surviving plants ensued in the sixth to seventh week after sowing, in the latter half of June, and again in the first part of August, though the older plants died less rapidly than the younger ones. These observations confirm the view that a relatively high soil temperature favours infection by *F. lini*.

In 1945, the same infested soil, in its fourth year under flax, was sown with La Plata seed free from disease organisms except for 0·5 per cent. of *P. lini*. Plots were sown with untreated seed and seed dressed with nomersan or with an 8 per cent. solution of ceresan U 564. Similar seed, untreated, was sown in a plot not previously used for flax. Sowings were made on 18th April and 9th May. In both sowings the only reduction of stand in the plots free from *F. lini* was a slight mortality in the seedling stage due entirely to *P. lini*. The number of living plants in the infested soil, on the other hand, declined continuously, particularly during the hot weather in August. The symptoms resembled those due to *F. lini*, but the incidence of *P. lini* was also greater than in the control plots. Most of the older plants showed infection by both fungi. The moisture content of the seed before treatment was 8·1 per cent. and the period of storage was four to seven weeks, but the results obtained clearly showed that ceresan is a very useful protection against stem break due to *P. lini*. In both sowings, the stand curves for the untreated and nomersan-treated seed were very close, and 15 to 20 per cent. higher than the ceresan curve.

It is concluded that *F. lini* may cause severe damage to flax even in the climatic conditions prevailing in Britain. La Plata was highly susceptible, Redwing fairly so, and Bison somewhat more resistant. It was confirmed that flax can be attacked at any stage of development and that incidence is closely correlated with soil temperature. Locally, wilt was usually accompanied by attack by *P. lini*. Seed dressings gave considerable protection during the early stages of germination, but were less effective against attack on older plants.

McWhorter (F. P.). **Scale tip rot of Lilium longiflorum in the Pacific Northwest.**—*Plant Dis. Reptr*, xxxi, 4, pp. 159–161, 1947. [Mimeographed.]

The scale rot of *Lilium longiflorum*, variety Croft, continued to be widespread in coastal plantings of Oregon and California. The name 'scale tip rot' is proposed for this disease, which does not affect the growth of the plants but mars the appearance of the bulbs and provides entry for agents of decay.

Two types of symptoms have been noticed: either the tips and outer surfaces of the scales are discoloured with pitted, dark lesions, or they wither without prominent discoloration. The first type is far more usual and yielded *Cylindrocarpon radicicola* [*R.A.M.*, xviii, p. 154] as a dominant fungus organism in 1944. Similar studies in 1945 failed to detect *C. radicicola*, but several species of *Fusarium* [ibid., xxii, p. 434] and occasional dematiaceous isolates were found. The typical form of the disease was not reproduced when these isolates were inoculated into scales in Petri dishes and into bulbs in sand cultures, but the atypical form was reproduced with some species of *Fusarium*. Fungicidal applications to bulb tips in both years failed to control the disease. It is suggested that physiological factors cause a breakdown of the integumentary tissue which provides for the subsequent invasion by fungi.

Jørstad (I.). **Løvemunnrust og Løvemunnskimmel. To nyinnvandrete parasitsopper.** [Snapdragon rust and Snapdragon mildew. Two newly introduced parasitic fungi.]—*Norg. GartForen. Tidsskr.*, xxxvi, pp. 497–498, 1946. [English summary.]

In connexion with the appearance in south-western Norway of snapdragon rust (*Puccinia antirrhini*) and mildew (*Peronospora antirrhini*), the geographical distribution, symptomatology, and life-histories of the two pathogens are briefly described.

Puccinia antirrhini [*I.M.I.* map 40] has spread very rapidly in Europe since its discovery in France in 1931 [*R.A.M.*, xiii, p. 269] and was detected in Denmark and Sweden as early as 1934 and 1935, respectively [ibid., xiv, p. 239; xvi, p. 679].

Peronospora antirrhini was first observed as a parasite of the cultivated snapdragon (*Antirrhinum majus*) near Oslo in 1935, after which it did not reappear until 1944, when it was again reported from the same locality; a further outbreak occurred in the extreme south of the country in 1946. The mildew did not reach Denmark and Sweden until 1943 [ibid., xxv, p. 454].

Jones (F. R.) & Smith (W. K.). **Segregation of resistance to bacterial wilt in crosses involving Grimm Alfalfa.**—*J. Amer. Soc. Agron.*, xxxix, 5, pp. 423–425, 1947.

In his doctorial thesis (University of Wisconsin, 1938) R. A. Brink concluded that resistance to bacterial wilt [*Corynebacterium insidiosum*] could be introduced by means of hybridization into any of the widely cultivated susceptible lucerne varieties [*R.A.M.*, xiv, p. 174]. From a cross between the immune A 116–15 and the highly susceptible Grimm No. 8, several F_1 plants were selfed along with the parents. From each of the 50 seedlings from the ovule parent (Grimm), 70 from the pollen parent (A 116–15), and 170 seedlings of the most productive F_1 plant, four or five cuttings were made, and the clones thus developed inoculated and planted out in the spring. Seedlings from two other F_1 plants were inoculated directly. No infection occurred in 40 per cent. of the clones from the progeny of the A 116–15, whereas none of those from Grimm or the F_2 selections escaped altogether, though a few of the latter sustained only slight damage. The two F_2 populations inoculated directly gave rise to 35 and 62 per cent. healthy plants, while two more F_2 populations from a similar cross produced 17 and 44 per cent. resistant individuals.

In the F_1 offspring of crosses between three Grimm and four immune selections the following numbers of plants were immune: Grimm 3×T 38–11, 1 out of 10; T 28–5×Grimm 8, 2 out of 11; Grimm 8×A 116–15, 2 out of 7; T 37–1×Grimm 27, 1 out of 6; Grimm 27×A 116–15–1, 1 out of 10; and A 116–15–1×Grimm 27, 2 out of 14.

TUCKER (C. M.) & GREGORY (C. T.). **Azalea root rot in Missouri.**—*Plant Dis. Reptr*, xxxi, 3, pp. 111–113, 1947. [Mimeographed.]

Azalea [*Rhododendron*] root rot has been found in two greenhouses in the St. Louis area. It was first noticed in the south [of the State] in 1942 and the St. Louis plants came from that area. Isolations from infected tissues consistently yielded *Phytophthora cinnamomi* [*R.A.M.*, xii, p. 696; xxiv, p. 295].

BAIN (D. C.) & PRESLEY (J. T.). **A leaf disease of Kudzu new to the United States.**—*Plant Dis. Reptr*, xxxi, 5, pp. 188–189, 1947. [Mimeographed.]

During the summer of 1946 leaf-spotting and firing of kudzu (*Pueraria thunbergiana*) [*P. hirsuta*] was noted in Newton County, Mississippi. Dr. C. Chupp identified the causal organism as *Cercospora puerariicola* [*R.A.M.*, xvi, p. 493]. The angular spots, about 1 to 8 mm. in diameter, are dark brown when small, their centres becoming light brown with a dark brown border when they increase in size.

A firing of part or all of the leaf margin was noticed in most cases. The spots are evident on both surfaces of the leaves; on the lower they are a pale greyish-brown without a darker border. The conidia of *C. puerariicola* are coloured, obclavate, and vary in size from 20 to 135 by 3 to 6 μ. Chupp separates this species by the pale colour, obclavate shape, and small size of the conidia.

LAPORTE (L. J. S.). **Nouvelle campagne contre la brûlure bactérienne du Pommier.** [The new campaign against Apple fireblight.]—*Rep. Quebec Soc. Prot. Pl.*, *1943–44*, p. 17 [? 1947].

Fireblight [*Erwinia amylovora*] is stated to have caused heavy losses in recent years in the apple orchards of Quebec [*R.A.M.*, xxii, p. 10; xxiii, p. 4]. Environmental conditions appear to keep it in check in commercial orchards most of the time, but it is always present somewhere though it may remain unnoticed till it breaks out with great severity. Control measures are indicated.

BROWN (G. G.). **A method of topworking Pear trees for early maximum production and for reducing stony pit losses.**—*Sta. Bull. Ore. agric. Exp. Sta.* 438, 23 pp., 11 figs., 1946.

The primary purpose of top-working Bosc and Anjou pear-trees with Bartlett is to reduce losses from the stony pit virus disease [*R.A.M.*, xviii, p. 463; xxvi, p. 9], from which both varieties suffer and to which Bosc in particular is highly susceptible. As the fruit of the Bartlett is symptomless and normal in appearance, the variety can be used satisfactorily for top-working. Stony pit has spread to several fruit areas through infected nursery stock and losses in the Hood River Valley, Oregon, are often extensive. The disease was first observed [in Oregon] about 20 years ago.

From 60 to 75 Bartlett scions were grafted on to each of 17 Bosc trees in the spring of 1937, and an equal number of Bartlett buds were inserted in each tree in August. This procedure differs from the usual top-working method in the complete elimination of severe surgery, the stock growths not being removed. The average yields per tree in 1940, 1941, and 1942 were, respectively, 10·2, 10·2, and 6·2 lugs. The corresponding yields for the same years of Bartlett pears top-worked in 1938 on 10 Anjou trees were 8·7, 11·9, and 11·3 lugs, respectively. Nineteen unworked Bartlett trees in the same orchard yielded 9·2, 9·9, and 6·6 lugs, respectively.

HILDEBRAND (E. M.). **Internal bark necrosis (measles) of Delicious Apple in New York in relation to pH, minor element toxicity and nutrient balance of soil.**—*Plant Dis. Reptr*, xxxi, 3, pp. 99–106, 1947. [Mimeographed.]

Several investigations into this disease have been made recently [*R.A.M.*, xxvi, p. 16]. The present study was confined to a single orchard where new Red Delicious trees were planted on land where apples had been grown for 100 years. The first trees died as a result of internal bark necrosis three years later. Soil analyses showed that calcium, boron, and magnesium were deficient and the levels of manganese, iron, and aluminium were toxic. It is possible that the low pH (3·8 to 5) of the soil in which young trees were planted was caused by calcium and magnesium deficiency plus the addition of sulphur spray residues accumulated over several years in the top layer of the soil, which is the feeding range of the roots of the young trees. Applications of boron and nitrogen failed to confer any improvement in the condition. On the same site Rome Beauty, McIntosh, and Red Delicious showed abnormal leaf characteristics and also several Gold Delicious trees, two of which showed definite symptoms of internal bark necrosis.

MILLER (P. W.). **Fungi associated with root lesions of the Strawberry in Oregon.**—*Plant Dis. Reptr*, xxxi, 3, pp. 90–99, 1947. [Mimeographed.]

In Oregon, besides *Phytophthora fragariae* [*R.A.M.*, xxiv, p. 325], several other root troubles affect the cortical tissues, but not the core of strawberry roots, causing dwarfing and a reduction in size of the leaves and petioles. The former turn reddish-brown in early summer before the plant eventually dies. Both the fleshy primary and fibrous secondary roots develop dark-coloured lesions which occur anywhere along the root. Both root systems rot away, the secondary roots decaying first. This black root condition [ibid., xxvi, p. 46] is especially widespread in western Oregon and has resulted in heavy losses in recent years. Investigations on the fungi associated with these lesions were carried out from 1944 to 1946 by the writer in conjunction with the Oregon Agricultural Experiment Station, and it was found that there was no specific fungus consistently present but rather several different fungi of which those most commonly found were *Ramularia*, *Rhizoctonia*, *Fusarium*, *Chaetomium*, *Penicillium*, *Phytophthora*, *Pythium*, *Verticillium*, *Oothecium*, and *Pestalotia* spp. In inoculation tests *Ramularia* and *Rhizoctonia* were found to be the most pathogenic of the genera tested, those feebly pathogenic were *Stemphylium*, *Phytophthora*, *Fusarium*, and *Verticillium* spp.

WHITEHEAD (T.) & WOOD (C. A.). **Virus diseases of the Strawberry. I. The field problem in North Wales.**—*J. Pomol.*, xxii, 3–4, pp. 119–133, 1 fig., 2 graphs, 1947.

The decline in yield of commercial strawberry plantations in the Dee Valley, Denbighshire, has gradually reduced the area under this crop locally from 750 acres in 1914 to about 50 in 1945. A study of the problem, begun in 1938, showed that the degeneration was caused solely by virus diseases [cf. *R.A.M.*, xxv, pp. 459, 460]. Both in the Dee and Conway valleys the onset of serious degeneration coincided with the introduction of new varieties, some of which proved to be symptomless carriers. Royal Sovereign is almost irretrievably ruined, and even the vigorous carriers are degenerating.

Investigations were accordingly carried out into the ecology and biology under North Wales conditions of the strawberrry aphid *Capitophorus fragariae*, the correct name for which the authors consider to be *Pentatrichopus fragariae* Theob., and a survey was made of the local commercial plantations to ascertain if any correlation could be established between aphid populations and crop degeneration. Isolated plots of vigorous, symptomless stocks of Royal Sovereign and other

varieties remained aphid-free until 1943 (since when a small number of *C. fragariae* have been recorded on some plots), and a promising industry of healthy runner production has been started. The amount and rate of serious degeneration (i.e., severe forms of strawberry dwarf, yellow edge, and crinkle) [loc. cit.] was found to be related to the intensity of the population of *C. fragariae*. In seasons of low aphid population it is easy to select vigorous, virtually symptomless runners from maiden (first-year) beds for propagation, but when infestation is high the beds become overwhelmed by disease at any age. Of aphid species commonly found on strawberry, *C. fragariae* alone was demonstrated to act as a vector. All the available evidence indicates that there is no source of the viruses apart from cultivated strawberry varieties.

C. fragariae does not 'inherit' virus infectivity from a viruliferous, viviparous parent, but is capable of picking up and transmitting a virus from crinkle-affected plants within 24 hours of birth. Transmission is possible by a single individual at all seasons. Less than two hours' feeding on an infected plant, followed by one hour on an indicator plant, may suffice to transmit a strawberry virus to the latter.

Control must be based on eradication of the aphid, or the disease foci, or both. Nicotine fumigation is, however, unlikely to prove sufficient by itself. The eradication of disease foci also presents a difficult problem. Vigorous runners can be raised from healthy plants grown in isolation in pastoral areas in North Wales and may be used to build up the healthiest possible commercial stocks [ibid., xxiv, p. 156]. But if such runners are planted near infected, older stocks, their health will break down in years of high aphid prevalence, in spite of nicotine treatment.

The final solution lies, doubtless, in the development of resistant or immune varieties that are also commercially acceptable. Meanwhile, the regular fumigation of plantations and the constant improvement of runner stocks by the present system of certification by the Ministry of Agriculture [ibid., xxv, p. 288] offer the most promising means of rehabilitating the strawberry industry.

WOOD (L. K.). **Some causes of malnutrition in Cane fruits.**—*Proc. Soil Sci. Soc. Amer., 1945*, x, pp. 260–262, 1946. [Abs. in *Chem. Abstr.*, xli, 9, p. 2834, 1947.]

Fertilizer tests were carried out in Oregon with red raspberries and boysenberries on Powell silt loam, with black raspberries on Olympic silty clay, and with gooseberries on Amity silty clay. Leaf scorch, associated with a low potassium oxide content, was corrected by ample supplies of fertilizers containing this compound. The use of a complete fertilizer with a high potash ratio produced a striking increase in cover-crop growth and in berry size and yield, besides helping to prevent the development of crumbly fruits. Zinc sulphate, applied either as a salt to the row or as a spray to the leaves, increased the red raspberry yield, while copper sulphate acted similarly on the black varieties in Olympic soil. Some improvement in production was also effected by soil amendments with magnesium sulphate, while treatment with phosphorus pentoxide, combined with early autumn cover crops, was beneficial in the reduction of winter injury.

EASTWOOD (H. W.). **Bunchy top disease of Bananas controlled by co-operative effort.**—*Agric. Gaz. N.S.W.*, lvii, 11, pp. 571–577, 3 figs., 2 graphs, 1 map, 1946; lvii, 12, pp. 643–646, 4 figs., 1946; lviii, 1, pp. 26–30, 2 figs., 1947.

The banana-growing industry in Australia was badly crippled by the bunchy top disease [banana bunchy top virus: *R.A.M.*, xxii, p. 48] from 1923 to 1927. The first of these articles regarding the system of control administered by the Department of Agriculture in conjunction with the Banana Growers' Federation describes the devastation wrought by the disease, traces the development of the control system [ibid., viii, p. 512], and indicates the measure of re-establishment already accomplished. Up to 1934 the control measures had reduced the incidence of bunchy top

to a very low level [ibid., xv, p. 592]. In 1935, however, it broke out again because the growers reduced plantation labour. The chief weaknesses in the control scheme then were that banana plantations were too numerous for adequate inspection, negligent growers could not be dealt with soon enough, and penalization of unco-operative growers was useless. In 1935 the Banana Growers' Federation helped growers by sending out men to spray diseased stools with kerosene [paraffin]. Although an attempt was made in some southern areas to eradicate the disease this was not the aim in the Tweed, Brunswick, and Richmond River [ibid., xix, p. 31] districts where a satisfactory control was claimed.

The second article gives a more detailed account of the current control system. The plantations are classified into (*a*) hot spots, (*b*) lightly infected, and (*c*) very lightly infected areas and are inspected more frequently (three-weekly) if more severely infected. The method of inspection varies according to the severity of the infection from close, leaf to leaf examination in bad areas to wide and random surveys where records are good. Diseased stools are recorded and then sprayed at once to kill aphids; the grower is notified and is obliged to destroy all diseased stools promptly and efficiently, measures being taken against 'faulty eradications'. Minute daily records have contributed towards annual statistics. To assist growers during the campaign a digging-out fund was introduced during 1936 but ceased operating in 1946 when it was no longer required.

In the third instalment the author describes the attempts at eradication of the disease at Yarrahappini [ibid., xxi, p. 149]. This campaign, which began early in 1937, was designed for the protection of important commercial plantations farther north. The movement and planting of suckers was prohibited from February, 1938 to September, 1945. The area was frequently and thoroughly inspected and diseased stools destroyed. Up to 1940 the disease decrease was encouraging but results have since been disappointing. Planting was permitted again in September, 1945, after a three-year period of freedom from the disease. Previously, from May, 1938, the disease had remained confined to five plantations and did not infect the healthy areas. In 1946 six infected stools were recorded. The most disconcerting aspect of the disease is that it remains dormant in the plant, a distinct setback to the campaign. During the eight years from 1937 to 1946 the Yarrahappini campaign cost the Banana Growers' Federation £3,950 and the disease still persists in one plantation. The success of the general campaign, however, is indicated by the present State acreage of 21,663 acres, only 626 acres less than in the record season of 1933–4. Bunchy top losses have been reduced from 42,305 stools (0·6 per cent. of the acreage) in 1936–7 to 5,144 (0·05 per cent.) in 1945–6, the financial loss has been more than halved, while production has risen from 66 to 91 tropical cases per acre.

ACUÑA (J.) & DE ZAYAS (F.). **El mosaico y otras plagas de la Fruta Bomba (Carica papaya L.).** [Mosaic and other pests of Papaw (*Carica papaya* L.).]—*Circ. Estac. agron. Cuba* 85, 32 pp., 14 figs., 1946.

The papaw in Cuba suffers from two types of mosaic [*R.A.M.*, xviii, p. 808], of which the more widespread (A) corresponds with bunchy top [ibid., xxvi, p. 114]. The other (B), confined to certain localities in Habana, is known as 'Cotorro mosaic' from the place of its discovery. This form of the disease is much more destructive than (A), causing 100 per cent. infection on a number of Jamaican and Trinidad selections and other varieties. It may be recognized by the circular, greenish spots on the base of the young petioles, and sometimes on the stems, expanding with the growth of the plant to several centimetres in length and up to 1 cm. in width and becoming hook- or U-shaped. In heavily infested areas the fruits may also be spotted, but the lesions do not extend as in the case of the petioles and stem. The abrupt shortening of the internodes and the torsion of the stem

typical of bunchy top have not been observed in the case of 'Cotorro mosaic', while another distinctive feature of the latter is the abundant flow of latex, resulting from punctures in the fruits, which consequently fail to mature and are of insipid flavour. The basal leaves, instead of developing at right angles to the stem, describe an obtuse angle or form clusters, often persisting after the defoliation of the upper part of the tree; in some cases a new tuft of small leaves may be produced higher up the trunk. The flowers drop simultaneously with the leaves, interrupting the setting of the fruits. In affected seedlings, and sometimes even in older plants, only the fibrous tissue of the leaves may develop and the veins, instead of being arranged in pinnate form, run in parallel lines, separated by a conjunctive tissue devoid of chlorophyll. Severely infected young leaves may show necrotic areas suggestive of chemical injury. The virus does not appear to be seed-borne. Some idea of the rapidity of its spread may be gained by observations in 1946 at the Habana Agricultural Experiment Station where the number of diseased trees rose from one in February to 160 at the end of June.

The Orlando, Solo, Florida, and Sabatier varieties are the most susceptible to bunchy top, Colombia, Mamey de Botánica, Castilla, and Mamey being comparatively resistant. The difficulties of breeding for resistance to the viruses are greatly complicated by the extreme susceptibility to Cotorro mosaic of all the varieties tested. Pending further investigations on this aspect of control, fruits intended for seed should be taken exclusively from healthy trees, all diseased plants promptly destroyed, weeds eradicated to avoid the perpetuation of the viruses by carriers, and strict hygienic precautions observed in the plantations.

Scarcely one adult plantation is free from *Pucciniopsis caricae* [loc. cit.], while other fungal diseases include *Gloeosporium* [? *papayae*: loc. cit.], perhaps the most important source of spoilage at harvest-time, *Phyllosticta*, *Rhizoctonia*, *Oidium*, and *Meliola* spp.

LANGFORD (G. S.). **Entoma: a directory of insect and plant pest control. Sixth edition.**—320 pp., published by the Eastern Branch of the American Association of Economic Entomologists, sixth edition, 1945. $1.00. [Received May, 1947.]

This publication, designed to assist plant pathologists and others interested in plant pest control to obtain information of a kind that is sometimes difficult of access, includes articles on insecticides and fungicides, spreaders, penetrants, adhesives, and emulsifiers, diluents, and so forth, as well as a number of useful tables. Alphabetical lists are given of plant protectants and equipment, the names of the suppliers being listed, and of services, agricultural officials, seed analysts, societies, and so forth.

KEARNS (H. G. H.). **Disease, pest and weed control equipment for horticultural crops.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 51–56, 1947.

After referring to the importance of disease and pest control in horticultural practice, the author gives brief notes on the types of equipment at present used.

Recent progress has been mostly in the design of fruit-spraying equipment, the war having made it possible to demonstrate the outstanding advantages of a large-sized, high-efficiency tractor-drawn and -driven outfit, the sprayer with a 300-gal. tank and an output of 20 g.p.m. being the most convenient. Further minor advances may be made by the use of multi-nozzle brooms and in the technique of application, but it is clear that the peak of efficiency of the lance handled by the walking spray operator has been almost reached. If the effort and cost involved in spraying are to be reduced and the speed of application increased, the

problem will have to be approached from a new angle. Either the type of machine must be some form of self-propelled outfit with a man-operated spraying turret or trees will have to be grown to suit a machine with spray bars. With few exceptions, dusting is as yet a poor substitute for spraying and progress with the design of dusting equipment is not worth while attempting until the value of dusting has been properly investigated.

CHESTER (K. S.). **National requirement and availability of botanists.**—*Amer. J. Bot.*, xxxiv, 4, pp. 240–243, 1947.

From two statistical surveys of personnel requirements in botany and plant pathology, respectively, in the United States, based on replies to questionnaires submitted to a leading botanist in each State and Territory and in the Department of Agriculture, the author concludes that in both fields a minimum deficit of 17 to 20 per cent. of the trained personnel is to be anticipated by 1950 [cf. *R.A.M.*, xxv, p. 512].

WHYTE (R. O.). **Crop production and environment.**—372 pp., 12 figs., 32 pl., 41 graphs, 3 maps, London, Faber & Faber, 1946, 25*s*.

This book, in which the author has brought together as much as possible of the recent research on the developmental physiology of plants, particularly crops, is of general interest to the plant pathologist. The chapters on photoperiodism, resistance to adverse environment (including a short reference to the relationship between resistance to fungous diseases and physiological development), and breeding in relation to environmental requirements are of special importance in view of the interchange of plants for breeding between different parts of the world.

PERREAULT (C.). **Le climat et les maladies des plantes.** [Climate and plant diseases.] —*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 11–16 [? 1947].

In this paper the author discusses the effect of climatic factors on the incidence of plant diseases with particular reference to the conditions obtaining in Quebec Province. To give a few examples: infection of flax by *Fusarium oxysporum* f. *lini* [*F. lini*] does not flourish in soils with a wide temperature range (12° to 38° C.). Onion smut (*Urocystis cepulae*) is present in Montreal, but not in the Lower St. Lawrence area, where the soil temperature is under 10° during May, when sowing is carried out. To avoid wheat infection by *Tilletia levis* [*T. foetida*] (which becomes serious when the soil temperature is between 2° and 7°), the autumn sowings are carried out in the Lower St. Lawrence area in the last fortnight of August, when the figure is about 15°. The effect of soil moisture is shown by the fact that flax even when attacked by *Colletotrichum lini* [*C. linicola*] grows vigorously in a well-drained soil, whereas in one that becomes sodden during the first few weeks after sowing young plants readily become infected. In such cases the virulence of the fungus seems to be enhanced. Reference is also made to the effect of wind and light on the development and spread of various forms of leaf infection. The paper concludes with the suggestion that the number of meteorological observation posts in agricultural areas in Quebec might usefully be increased.

CHAPMAN (G. H.). **The significance of, and methods for, maintaining moisture in bacteriological culture media.**—*J. Bact.*, liii, 4, p. 504, 1947.

The loss of moisture from the surface of agar plates stored in refrigerators can be greatly reduced by enclosing the plates in metal cylinders sold for this purpose and sealing the joint between top and bottom sections, preferably with waterproof adhesive tape, parafilm, or a rubber band. Tubes of culture media can be sealed by covering the plug or screw cap and rim with parafilm.

GROVES (J. W.) & SKOLKO (A. J.). **Notes on seed-borne fungi. II. Alternaria.**—*Canad. J. Res.*, Sect. C, xxii, 5, pp. 217–234, 10 pl., 1944.

In this paper [cf. *R.A.M.*, xxiv, p. 42; xxv, p. 590] the authors describe and figure seven species of *Alternaria* (six of which are pathogenic) isolated from 47 species of agricultural seed received at Ottawa.

A. tenuis was isolated from all the seeds tested, and appears to have a world-wide geographical distribution [ibid., xxvi, p. 51]. *A. brassicae* was isolated from seeds of cabbage, cauliflower, rape, and radish of Canadian, United States, and Dutch origin.

A. dauci (Kühn) n.comb., the cause of an occasionally serious leaf blight of carrots, was found only on two samples of seed from Nova Scotia and Ontario. It is close to *A. brassicae* morphologically but differs from it in its darker spores, the beaks of which are slenderer, more pointed, and more branched, and in its cultural characters and host relationships. The earliest name of the species appears to be that proposed by Kühn, who described it as *Sporidesmium exitiosum* var. *dauci*. Rostrup raised Kühn's variety to specific rank as *Macrosporium dauci*. Neergaard has shown that Rostrup misidentified the fungus and was working with that later described as *A. radicina* [ibid., xv, p. 768]: nevertheless Article 54 applies here, and Rostrup's combination must be considered as based on Kühn's type. There appears to be little doubt that *M. carotae* is the same species.

A. linicola n.sp. [ibid., xxv, p. 581], found on flax seeds from Quebec, Ontario, Manitoba, Saskatchewan, and Alberta, produces effused, cottony, slightly concentrically zoned colonies on malt agar, deep to dark olive-grey, pale at the centre; the septate, branched, hyaline to pale smoky-olive hyphae measure (2) to 4 to 7 μ in diameter, and the pale olive-brown, septate, simple, conidiophores are 5 to 8 μ in diameter, and very variable in length; the obclavate conidia, not found in chains, gradually attenuated above into a long, slender, sometimes branched beak, were olive-brown, smooth, muriform, had 7 to 11 transverse septa, at which they were slightly constricted, and measured (130) to 150 to 300 by (15) to 17 to 24 μ.

A. raphani n.sp. [loc. cit.] forms effused, cottony, zoneless, pale olive-grey to pale gull-grey, occasionally darker to olive- or iron-grey colonies on malt agar. The septate, branched, hyaline to smoky-olive hyphae measure 2 to 5 to (7) μ in diameter. The numerous chlamydospores are olive-brown, at first one-celled, round, finally many-celled and irregular. The olive-brown, septate, simple or sometimes branched conidiophores vary greatly in length, measure 4 to 7 μ in diameter, and are generally larger towards the tip. The conidia are arranged in short chains, obclavate, beaked (the beak usually being short), smooth, olive-brown, muriform, with 3 to 9 transverse and numerous longitudinal septa, at which they are constricted. They measure (40) to 50 to 70 to (94) by 15 to 25 to (45) μ on seedlings on agar in Petri dishes, and (55) to 70 to 115 to (135) by 14 to 18 to (25) μ on inoculated leaves in the greenhouse. The fungus produces black, circular spots up to 4 mm. in diameter on the seed pods of radish [ibid., xxvi, p. 8]. It was isolated from radish seeds originating in Ontario, Quebec, and British Columbia, and those imported from California, Michigan, Minnesota, New Jersey, Ohio, and Pennsylvania. Inoculations in the greenhouse on seedlings of radish, cauliflower, broccoli, swedes, cabbage, and wallflower (*Cheiranthus cheiri*) gave positive results on all but wallflower.

A. radicina was isolated frequently from carrot seed, occasionally from parsley, and once from vegetable marrow.

A. oleracea is of wide geographic distribution and appeared on seeds of swedes, broccoli, cauliflower, cabbage, radish, and runner bean (*Phaseolus coccineus*).

GROVES (J. W.) & SKOLKO (A. J.). **Notes on seed-borne fungi. III. Curvularia.**—*Canad. J. Res.*, Sect. C, xxiii, 3, pp. 94–104, 7 pl., 1945.

Continuing their investigations on seed-borne fungi [see preceding abstract]

the authors made a study of the species of *Curvularia* found during their examination of agricultural seeds. The species observed, which exhibited no marked host specificity and appeared to have no pathological significance, were *C. geniculata* from cabbage, flax, and pea; *C. inaequalis* from turnip, flax, pea, rye, spinach, and maize; and *C. trifolii* from soy bean, pea, cucumber, and pumpkin (all identified by comparison with types); *C. lunata* from onion and chilli pepper; and *C. pallescens* from cauliflower and turnip (both identified provisionally from the literature). *Helminthosporium cymbopogi* [*R.A.M.*, xxi, p. 419] is transferred to *Curvularia* as *C. cymbopogi* n. comb. The authors found that the spore measurements of the type specimens of the four North American species, *C. geniculata, C. inaequalis, C. trifolii*, and *C. falcata*, failed to agree with the published descriptions of the original authors. A subculture of one of the original isolates of *C. cymbopogi* did, however, produce spores agreeing in size with the measurements given in the diagnosis.

Groves (J. W.). **Variations in Botrytis cinerea.**—Abs. in *Proc. Canad. phytopath. Soc., 1946*, 14, p. 13, 1946.

Analysis made in 1938 of 177 single-ascospore cultures from the apothecia of nine different isolates of *Botrytis cinerea* [*Sclerotinia* (or *Botryotinia*) *fuckeliana*: *R.A.M.*, xxv, p. 235] demonstrated that 18 produced only white mycelium, without conidia or sclerotia, 17 gave abundant macroconidia and no sclerotia, while 142 were intermediate and showed some sclerotia and macroconidia. Many of the cultures were discarded, but of the others three originally of the white mycelial type and two of the conidial remained as at first described. Fifty-nine of the original intermediate type remain, of which ten are now like the white mycelial type, two resemble the conidial type, and the others are still intermediate. According to the dual-phenomenon hypothesis [see next abstract] the mycelial types might be regarded as M types, the conidial as C types, and the others as MC types. Since, however, all these came from single ascospores and there was no possibility that heterocaryosis was a factor, the validity of this hypothesis as an explanation of variation in *S. fuckeliana* would appear to be doubtful.

Miller (J. J.). **The theories concerning variability in fungi.**—Abs. in *Proc. Canad. phytopath. Soc., 1946*, 14, p. 13, 1946.

Hansen's 'dual phenomenon' theory [*R.A.M.*, xxii, p. 490] assumes that variants arise through the segregating out of genetically different nuclei from multinucleate mycelia. This fails to account for the appearance of variants in the progeny of uninucleate, haploid conidia, which must be attributed to mutation. 'Adaptive variation' results from the appearance of adapted types through mutation.

Hawes (Ina L.) & Eisenberg (Rose). **Bibliography on aviation and economic entomology.**—*Bibliogr. Bull. U.S. Dep. Agric.* 8, iv+186 pp., 1947.

This work, comprising very short abstracts of 1,084 publications and 32 pages of index, is a revision and enlargement of the Bibliography on the Use of Airplanes in Insect Control, 1922 to 1933, compiled by W. E. McBath in 1934. It covers the years 1919 to 1944 and includes some 1,945 references. Three of the entries deal with fungi.

Moore (W. C.). **New and interesting plant diseases.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 250–258, 3 pl., 1946.

This is another contribution to the author's series of notes on plant diseases in Britain [cf. *R.A.M.*, xxv, p. 568]. In 1945, and again in 1946, he received garden specimens of corn salad (*Valerianella* [*locusta* var.] *olitoria*) from the vicinity of Bodmin, Cornwall, bearing *Oidium valerianellae*, with long-elliptic, oblong, or barrel-shaped conidia, 27 to 39 by 13 to 21 μ.

In September, 1941, a leaf spot causing partial or complete defoliation of elder was observed in a beech wood near Harpenden. The spots were numerous, visible on both sides of the leaves, mostly 2 to 5 mm. across, rounded, or bounded by the secondary veins, uniformly dull grey when small, and later becoming bleached dirty white or pale brown, usually with a dull grey border. The conidia of *Cercospora depazeoides* occurring on both sides measured 50 to 147 by 4 to 6 (average of 25, 89 by 4·9 μ), one to six transverse septa were present. The disease was later reported from three other localities.

In Britain, black rot (*Sclerotinia tuberosa*) [ibid., ix, p. 134] attacks the native *Anemone nemorosa*, but has been found in the past mainly in gardens and rockeries on cultivated varieties of *A. nemorosa*, as well as on *A. coronaria*, *A. apennina*, *A. blanda*, and *A. ranunculoides*. It may be destructive to pot plants, but seldom occurs in commercial plantations. In the only recorded outbreak in Britain in recent years (May, 1933), very large numbers of apothecia appeared in a rock-garden near Birmingham, where few of the anemones remained unaffected. In October, 1941, the author received from Buckinghamshire rhizomes of *A. nemorosa* var. *robinsoniana* completely destroyed by the fungus during storage. The sclerotia were black, irregular, round, hard bodies up to $1\frac{1}{4}$ in. across and almost $\frac{1}{2}$ in. thick; they were white inside, and consisted of a mass of interlacing hyphae 4 to 6 μ wide surrounded by a narrow, black rind 15 to 40 μ thick.

Cos lettuce plants of the Balloon variety raised under glass and pricked out for summer use in two adjacent gardens at Harpenden in mid-July, 1942, developed a disease later found to be due to the dandelion yellow mosaic virus [ibid., xxv, p. 492]. Several plants, evidently attacked when quite young, were only 6 in. instead of a foot tall. The outer four or five leaves were small, but in other respects appeared to be normal. The next inner leaves were small and narrow, crimped or puckered, and displayed a conspicuous general necrosis; this began as minute, somewhat angular, pale brown, interveinal dots later coalescing to form patterns of dark brown, grey-brown, or almost black tissue immediately bordering the veins in the middle of the leaves. The margins of some leaves were wilting or withered, and in others the tips and sometimes the margins for $\frac{1}{2}$ cm. inwards presented a burnt appearance. Affected plants with outer leaves still green, turgid, and a foot long showed different symptoms, the next inner leaves being pale, and partly withered from the tips or margins inwards. The tissues were brown, dry, and papery, or the interveinal areas had dropped out. The veins usually showed brown or black streaking. Other plants bore a few scattered, inconspicuous, pale brown areas on the outer mature leaves, while the next inner ones showed only a local or diffuse and ill-defined necrosis, the chief symptom being a ladder-like brown fretting of the outer, and occasionally of the inner, surface of the main and lateral veins. The youngest leaves seldom showed more than a faint necrosis. This lettuce disease has very probably been present in England for some time.

Since its discovery on Dutch lettuces imported into England in 1930, *Puccinia opizii* has twice been observed in this country, on both occasions on lettuces imported from Holland. It was found in the London market in 1932 [ibid., xiii, p. 10], and in May, 1946, a few aecidia were seen on the outer leaves of lettuces in four of ten crates examined on the quayside at Newcastle-on-Tyne. The aecidia have a complete and well-developed peridium, form fairly large spots, and cause no hypertrophy of the leaf tissues. The aecidium found on lettuce in North America appears to be different, and for this Kern accepted the name *P. patruelis* Arthur.

Radish canker, observed only a few times in Britain, was first recognized on specimens from Taplow in 1928, when *Corticium solani* [cf. ibid., xiii, p. 725; xiv, p. 340] was isolated in pure culture. In June, 1935, the disease was reported to have developed in patches on two farm crops, one on sandy soil at Mortlake (Surrey), the other on heavier soil at Bedfont (Middlesex). Specimens from Mortlake showed

dark, soft, canker-like lesions on the sides or near the top of the swollen portion of the root, and no difficulty was experienced in isolating *C. solani* from the advancing margin of the rot where there was abundant mycelium. Healthy radishes inoculated with a pure culture of the organism developed the rot after only a day or two, the disease progressing so rapidly that within a fortnight only the discoloured skin and part of the vascular network remained intact as in naturally infected radishes. It was estimated that at Mortlake not more than one plant per thousand was affected, but this was sufficient to spoil the appearance of the bunches. At Taplow the disease occurred every year, but caused no serious trouble. Preliminary tests indicated that strains of *C. solani* from potato would not infect radish. The radish strain failed to infect carrots, parsnips, mangolds, and potatoes inoculated late in July, but white turnips and radishes inoculated the same day were completely rotted by mid-August. These results were later confirmed and extended by Storey [ibid., xx, p. 591].

In June, 1942, the author examined diseased flax seedlings about 6 in. high, from Hampshire, the cotyledons of which were brown and fell off at a touch. Most of the affected cotyledons were blackened as a result of the presence of tufts of conidiophores and conidia of a species of *Alternaria* identified as *A. linicola* Groves & Skolko [see above, p. 405]. Some seedlings showed minute, dark spots on the first pair of foliage leaves above the cotyledons. The spots spread irregularly to produce necrotic areas 1 to 2 mm. across, and on a few seedlings this pair of leaves was completely discoloured and shrivelled. There was also an occasional pale brown streak on the stem just above the cotyledons, and more frequently a scarcely perceptible, shallow, canker-like area on the hypocotyl or at the base of the main root. The rim of the canker was reddish-brown, and reddish-brown streaks passed from it upwards into the hypocotyl. The conidia measured 60 to 235 by 11 to 27 with a beak 15 to 135 μ, and showed 4 to 11 transverse septa.

LEDINGHAM (G. A.). **Methods of preservation of fungus cultures.**—Abs. in *Proc. Canad. phytopath. Soc., 1946*, 14, p. 15, 1946.

In the 'lyophile' method of preservation, found satisfactory for most small-spored fungi, yeasts, and bacteria, a heavy spore suspension is made in a sterile 12 per cent. aqueous solution of difco skim-milk powder, and using a sterile Pasteur pipette 1 c.c. aliquots are transferred to sterile pyrex ampoules. The ampoules are then 'quick-frozen' in an acetone dry ice bath and transferred to a chilled vacuum desiccator, which is evacuated overnight. The tubes are next evacuated on a manifold and sealed by cutting off with a hand torch with a cross-fire attachment. The dried culture then consists of a small water-soluble milk pellet sealed in glass under vacuum. Many species remain viable for years in these conditions.

JENKINS (ANNA E.) & BITANCOURT (A. A.). **Spot anthracnoses in the United States and some island possessions.**—*Plant Dis. Reptr*, xxxi, 3, pp. 114–117, 1 map, 1947. [Mimeographed.]

A distribution map and key list is given of 23 spot anthracnoses [*R.A.M.*, xxvi, p. 255] recorded in the United States, Puerto Rico, Guam, and Hawaii up to 1942. The list includes common name of the disease, Latin binomial and family of the host, and the pathogen relating to each anthracnose. The distribution of the 23 anthracnoses reported is based on records available in June, 1946.

JEHLE (R. A.), WALKER (E. A.), PRESTON (D. A.), & JENKINS (ANNA E.). **Additional records on distribution of Plantain scab.**—*Plant Dis. Reptr*, xxxi, 4, pp. 162–166, 2 maps, 1947. [Mimeographed.]

In Maryland, plantain scab (*Sphaceloma plantaginis*) is abundant on *Plantago rugelii*. More specimens were found in small towns than in open fields in the

country, which suggests that man is an important agent in spreading the disease. New records extend the known distribution of the disease to Oklahoma and Minnesota. On several occasions isolated groups of narrow-leaved plantain (*P. lanceolata*) were found with leaf spots resembling plantain scab. Microscopic examination showed that they were caused by *Cercospora plantaginis*, a fungus not previously reported in Maryland.

SIBILIA (C.). **La nomenclatura volgare in patologia vegetale. Proposte per una nomenclatura ufficiale.** [Common names in plant pathology. Proposals for an official nomenclature.]—*Nuovo G. bot. ital.*, N.S., lii, 1–4, pp. 87–91, 1945. [Received July, 1947.]

After mentioning the confusion that exists in Italy among the common names applied to plant diseases, several different names being applied in some instances to one and the same disease or one name serving for diseases caused by several different organisms, and also discussing, with illustrative examples, the difficulty of finding satisfactory Italian equivalents for foreign common names, particularly English names of virus diseases, the author refers to the work of the Plant Pathology Committee of the British Mycological Society in compiling a list of suitable common names in English [*R.A.M.*, xxiv, p. 425], and suggests that a committee should be established in Italy to perform a similar task for Italian workers. Official lists of common Italian names should give the common name of the host, the systematic group of the pathogen, the common name recommended, the Latin name of the pathogen, common Italian names used but not recommended, and, finally, the foreign common names. The principles that should guide the committee in the selection of the most suitable names are listed.

CHRISTENSEN (C. M.). **Molds and bacteria in flour and their significance to the baking industry.**—*Bak. Dig.*, xxi, 1, pp. 21–23, 2 figs., 1947.

During the past two years the writer has examined over 100 flour samples from mills in different parts of the United States for their mould and bacterial contents. In general, the mould incidence ranged from less than 200 to more than 5,000 per gm., being higher in flour milled in the more humid regions. About 20 species of moulds have been determined, with *Aspergillus glaucus* and *A. candidus* predominating [*R.A.M.*, xxvi, p. 239], while a large population of green *Penicillium* was found in occasional lots. It would appear from the evidence so far accumulated that flour may be excluded as a general source of bread spoilage, the relatively few organisms present being in any case destroyed by baking.

MILNER (M.) & GEDDES (W. F.). **Grain storage studies. IV. Biological and chemical factors involved in the spontaneous heating of Soybeans.**—*Cereal Chem.*, xxiii, 5, pp. 449–470, 6 graphs, 1946.

Spontaneous heating and associated respiratory characteristics of soy-beans at humidity levels conducive to mould growth [*R.A.M.*, xxv, p. 517] but not to bacterial proliferation were studied in an apparatus maintaining continuously controlled adiabatic and aeration conditions over periods of up to 37 days [ibid., xxi, p. 43]. An initial temperature rise to between 50° and 55° C. and parallel respiratory increase were directly associated with the multiplication of *Aspergillus glaucus* and *A. flavus*. A secondary spontaneous heating phase due to non-biological oxidation was demonstrated. Surface sterilization of the seeds failed to eliminate mould infection, but inoculation of autoclaved soy-beans with *A. flavus* spores resulted in heating and respiration curves virtually identical with those of the original sample.

ETTLINGER (L.). **Antibiose und antibiotische Stoffe der Pflanzen.** [Antibiosis and antibiotic substances of plants.]—*Schweiz. Z. Path. Bakt.*, ix, 5, pp. 352–378, 1946.

This is a discussion, illustrated by numerous examples from the relevant literature, of the information available to date concerning antibiosis, under the aspects of reciprocal antagonism between macro-organisms, macro-organisms against micro-organisms and vice versa, and reciprocal between micro-organisms; and antibiotics, defined according to current standards of terminology as (1) biogenic substances produced by living cells; (2) organic compounds of some complexity; and (3) germ toxins detrimental or lethal, in low concentrations, to the vital functions of micro-organisms, especially pathogens. A four-page bibliography is appended.

BOSE (S. R.). **Hereditary (seed-borne) symbiosis in Casuarina equisetifolia Forst.**—*Nature, Lond.*, clix, 4041, pp. 512–514, 1 fig., 1947.

Every *Casuarina equisetifolia* plant examined by the author (including plants from different parts of India and also from Australia) had mycelia of *Phomopsis casuarinae* in every organ, beginning with the seed-coat. The results of experiments with seedlings of *C. equisetifolia* in humus soil with a pure culture of *P. casuarinae* as well as of others made to lower the physiological condition of pot plants by keeping them in a glass chamber for two weeks confirmed the view that the physiological condition of the host determines the nature of the relationship between the two partners in a mycorrhizal association [*R.A.M.*, xxiii, p. 352]. Very weak seedlings in a moribund condition and pot plants in an abnormal state were killed outright by the fungus, which became strongly virulent, while slightly weak but normal seedlings were greatly invigorated by the fungal inoculation. It appears that the fungus begins as a symbiont, but ultimately induces the death of the plant or of some of its parts, as a parasite, after which it persists as a saprophyte and is succeeded by *Ganoderma lucidum*, *Fomes senex*, *F. durissimus*, *F. fastuosus*, *Polyporus calcuttensis*, and other fungi as members of a fungal complex.

In addition to *Phomopsis casuarinae*, *C. equisetifolia* also bears coralloid roots or nodules due to *Rhizobium casuarina* Dowson. The roots also possess root hairs at their growing ends. The fungus probably absorbs ammonia salts and complex organic nitrogen compounds such as nucleic acid and peptone and transfers them to the roots; it is probable that auxins and vitamins accumulated by the hyphae are translocated to the roots, while the molecular nitrogen fixed by bacteria (amino acid) is probably made available throughout the body of the plant. In return, the fungus obtains carbohydrates from the tree and phosphatides from the roots. This is regarded as a clear example of close co-operation between the plant, the fungus, and the bacterium for successful and healthy growth of the tree. Details of this work are expected to be published later.

BLUMER (S.). **Beiträge zur Physiologie von Trichoderma viride Pers. ex Fries.** [Contributions to the physiology of *Trichoderma viride* Pers. ex Fries.]—*Ber. schweiz. bot. Ges.*, liv, pp. 605–624, 3 graphs, 1944. [Received July, 1947.]

Trichoderma viride, one of the most active cellulose decomposing soil fungi [*R.A.M.*, xvi, p. 408], grows in synthetic nutrient solutions with cellulose as a source of carbon. When nitrogen is supplied in the form of nitrates, aneurin [vitamin B_1] and pyrimidine exert a slight stimulatory action on the growth of the organism, whereas thiazole is devoid of influence. When ammonium salts are the source of nitrogen (especially ammonium citrate), the slight initial stimulus afforded by vitamin B_1 and pyrimidine gives place later to a definite inhibition.

LILLY (V. G.) & BARNETT (H. L.). **The influence of pH and certain growth factors on mycelial growth and perithecial formation by Sordaria fimicola.**—*Amer. J. Bot.*, xxxiv, 3, pp. 131–138, 4 graphs, 1947.

The rate and extent of growth of *Sordaria fimicola* in the presence of a sufficiency of biotin is a function of the composition and initial pH of the medium. Normal development and reproduction are suppressed in the pH range of 3·4 to 3·8, the inhibitory factor, however, being counteracted by the addition of thiamin or its pyrimidine moiety [cf. *R.A.M.*, xix, p. 723]. Perithecia were produced only after the pH had risen above 6 and an adequate quantity of biotin was provided: the number of these organs depended on the concentration of the growth factor and is estimated to have been at least a hundredfold greater at the maximum of 0·16 μg. per flask than at 0·0025 or 0·005. Less biotin was required for vegetative growth than for sexual reproduction.

From a preliminary comparison of five isolates of the fungus it appeared that all need an exogenous supply of biotin, supplemented in one case by thiamin.

BARNETT (H. L.) & LILLY (V. G.). **The effects of biotin upon the formation and development of perithecia, asci and ascospores by Sordaria fimicola Ces. and de Not.**—*Amer. J. Bot.*, xxxiv, 4, pp. 196–204, 8 figs., 1947.

On a biotin-free medium *Sordaria fimicola* produced no perithecia in two months [see preceding abstract]. The addition of the growth substance at a range of 0·1 to 6·4 μgm. per l. after 42 days' incubation resulted in the development of these organs and in ascospore formation in proportion to the amount supplied. Perithecia were also formed by *S. fimicola* on a biotin-free substratum in the presence of certain species known to synthesize the vitamin, e.g., *Phycomyces blakesleeanus*, *Monascus purpureus*, and *Aspergillus rugulosus*. When the biotin supply was held constant at 0·1 μgm. and the provision of nutrients varied, mature perithecia and ascospores appeared more rapidly and in relatively larger numbers in those cultures where mycelial growth was limited by the meagre quantities of food. The available evidence indicates that the amount of biotin in the medium in proportion to mycelial weight at the time of perithecial formation must equal or exceed a ratio of approximately 1: 20,000,000 for the accomplishment of sexual reproduction by *S. fimicola*.

LEACH (J. G.) & BISHOP (C. F.). **Purple-top wilt (blue stem) of Potatoes.**—*Bull. W. Va agric. Exp. Sta.* 326, 35 pp., 1 col. pl., 12 figs., 3 graphs, 1 diag., 1946.

In this paper the authors review the present state of knowledge on purple-top wilt or blue-stem disease of potatoes [caused by the aster yellows virus: *R.A.M.*, xxv, p. 335] and describe the results of studies carried out on the disease in West Virginia since 1939. It appears to be most abundant in the northern and eastern regions of the United States [ibid., xxiv, p. 284], the range of greatest prevalence being from New York State westward to Minnesota and North Dakota and southward through the mountainous areas of Pennsylvania and West Virginia. It is reported as not being of any importance in the southern States or in the Far West.

Photographs and more complete descriptions obtained by correspondence clearly identify 'moron' disease [ibid., xii, p. 188] with purple top. Diseases with which purple-top wilt has been or may be confused include *Rhizoctonia* [*Corticium solani*] stem rot, certain types of blackleg infection [*Erwinia phytophthora*], some forms of mechanical injury, a wilt attributed to *Fusarium avenaceum* [ibid., xvii, p. 409], 'hay wire' [ibid., xvi, p. 490], purple dwarf [ibid., xx, p. 319], and 'stem-end browning' [ibid., xxvi, p. 119]. In diagnosing the disease points of primary importance are: (1) it is not tuber-transmitted and is never found on young plants, the first symptoms appearing at or after blossoming; (2) the plants always wilt

two or three weeks after the symptoms appear; (3) there is always necrosis of the vascular elements at the base of the stem, often spreading to the stem end of the tubers; (4) translocation is inhibited and carbohydrates accumulate in the tops. The remaining symptoms, including the purple pigmentation and production of aerial tubers, may vary with the potato variety, light intensity, temperature, and many other factors.

Evidence obtained in West Virginia since 1939 has confirmed the conclusion that the disease is caused by the aster yellows virus and is transmitted by *Macrosteles divisus*. Every year from 1939 to 1943, inclusive, 40 to 60 aster-cloth or screen-wire cages enclosing four to six potato plants were used for field inoculation experiments with aster leafhoppers and certain other insects. No plant became affected unless aster leafhoppers were introduced, the disease then appearing in 18·9 per cent. of 290 cages. Some of these leafhoppers were not known to be viruliferous, but when all viruliferous hoppers were used the figure was 40·8 per cent. in 98 cages. On the other hand, all attempts to transmit the virus from potatoes to asters failed. The virus could not be recovered from naturally infected potatoes or transmitted from potatoes to potatoes. Many attempts to perpetuate the virus by making cuttings from infected potatoes all gave negative results, the disease evidently affecting the physiology of the plant in such a way that normal graft unions and cuttings can be obtained only with great difficulty, if at all. The evidence demonstrated that the virus does not long survive in the potato plant.

It was found that the incubation period in potatoes (34 to 68, average 49, days in cage experiments) is longer than in asters and some other plants. Field infection probably occurs after 11th June and before 9th July. No evidence could be found that 'hair sprout' [ibid., xvii, p. 700] is a result of purple-top wilt. Comparative yield tests indicated that plants affected with purple-top wilt gave, on an average, yields of rather less than one-half of those from healthy plants. The minimum daily temperature appeared to be the principal factor controlling leafhopper movement. There was little movement, and few hoppers were caught when the minimum temperature was 60° F. or below. There were two periods of heavy flight each summer, but some moderately heavy ones always occurred in May and early June, and these appear to be responsible for the infection of potatoes.

As there is no evidence that aster leafhoppers breed on potatoes and the virus does not spread from potato to potato, infection on this host must arise from migratory adult leafhoppers.

No satisfactory control method has yet been devised, but there is some evidence that dusting or spraying the plants with DDT reduces infection.

Discussing seed-certification practices in relation to the disease, the authors express the view that if purple-wilt tolerance limits are established they should be based on the behaviour of the affected plants as weak plants rather than as plants affected with an infectious virus disease. Tubers from affected plants produce weaker plants than tubers from healthy ones and the yield is reduced on the average by about 24 per cent. Tolerances, if established, should be liberal, and flexible enough to allow for differences in date of inspection. Roguing should be permitted in order to meet the tolerances, and field inspections should be as late as possible.

LIST (G. M.). **Some relationships of insects to net necrosis of the Potato in Colorado.** —*J. econ. Ent.*, xl, 1, pp. 107–112, 1 graph, 1947.

Potato net necrosis [usually attributed to potato leaf roll+potato virus A] is prevalent in Colorado in some seasons, especially in garden patches and small acreages. The symptoms closely resemble those of psyllid yellows induced by *Paratrioza cockerelli*, to which, in fact, the disease has been referred [cf. *R.A.M.*, xxvi, p. 119]. However, greenhouse and field tests yielded no evidence in support of this view. A careful analysis of the data from exposed plots and those protected

by aster-cloth fences from the six-spotted leafhopper, *Macrosteles divisus*, indicated that the exclusion of the insect prevents both the infection of asters by the aster yellows virus [ibid., xxvi, pp. 120, 208, and proceeding abstract] and of potatoes by that of net necrosis. Heavy psyllid infestation in a plot protected in this way did not result in an outbreak of net necrosis, which appears, on the basis of these experiments, to be in all probability attributable to the aster yellows virus.

MATTHEWS (R. E. F.). **Status of Potato virus B.**—*Nature, Lond.*, clix, 4047, pp. 713–714, 1947.

From a serological comparison of Up-to-Date potato streak virus [a strain of potato virus X: *R.A.M.*, xxii, p. 76], supplied by Clinch, with virus B [another strain of potato virus X: ibid., xvi, p. 53] from Bawden's source in Duke of York it was concluded that the latter has an antigenic portion which differs from the streak virus in Up-to-Date. The reverse is also probably true, though the possibility that part or all of this difference may be caused by an X-type strain present together with the streak strain in Clinch's material has not been eliminated.

The suggestion is made that virus B is no more a single entity than is virus X. Many strains of X may, perhaps, be found which do not give top necrosis on varieties such as Epicure and King Edward. This conclusion, together with the results obtained by Bawden and Sheffield [ibid., xxiii, p. 403], indicates that no sound basis exists for giving the strains known as 'virus B' any special status within the X Group.

CLINCH (PHYLLIS E. M.) & MCKAY (R.). **Effect of mild strains of virus X on the yield of Up-to-Date Potato.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxiv, 21, pp. 189–198, 1947.

Two Up-to-Date potato plants free from virus X having been found in Ireland in 1943, an experiment was begun to ascertain to what extent X-free plants of this variety would outyield carrier plants [cf. *R.A.M.*, xxiii, p. 144; xxiv, pp. 162, 335].

It was deemed necessary that infected plants should be obtained by using infected tubers. To obtain this stock of infected tubers two large X-free Up-to-Date tubers, clonal progeny of the original plants, were selected, each being cut into three sets, the six sets being planted in pots in an insect-proof glasshouse. One plant of each clone remained as a healthy control, while the remaining two were grafted with scions of Up-to-Date carrying mild strains of virus X. The two strains of the virus used, both of which occur naturally in Up-to-Date, were (*a*) a typical mild strain, identified as the potato 'mottle' virus of North America [ibid., xiv, p. 523], and (*b*) formerly known as 'Up-to-Date streak' and later as virus B [see preceding abstract].

In 1945, the produce of the six units was grown in a small isolated plot among beans in a freshly ploughed pasture field. In July, the plants were tested by inoculation into *Datura stramonium*, and it was found that virus X was present only in the plants grafted with infected scions the previous year. With clone I the average yields per plant for the healthy plants and those infected with strains (*a*) and (*b*) were, respectively 4 lb. 1 oz., 4 lb. 1 oz., and 5 lb. 4 oz., the corresponding figures for clone II being 5 lb. 5 oz., 5 lb. 7 oz., and 5 lb. 15 oz.

In 1946 the tubers of each healthy clone were graded according to weight and selections for planting were made from them in such a way that an equal number of tubers of similar weight was available from the infected units of the clone corresponding. Up to the middle of June no difference was detected between the healthy and infected plants. About the middle of June, however, some of the plants of clone II infected with strain (*b*) developed leaf roll, but no more developed for the remainder of the season, nor was there any difference in appearance between

the healthy and X-infected plants generally. Inoculation tests with *D. stramonium* demonstrated that all the originally healthy plants were still X-free. Blight (*Phytophthora infestans*) developed towards the end of August in spite of spraying with Burgundy mixture, and killed off the plants prematurely. The average yield of tubers per X-free plant was 3 lb. 8 oz. Plants infected with strain (*a*), clone I, yielded 3 per cent. less than the healthy, while those of clone II gave 4 per cent. more. Plants infected with strain (*b*), clone I, outyielded the healthy by 13 per cent., while those of clone II gave 14 per cent. less. This reduction, however, was clearly due to primary leaf roll, and apart from this last figure, the results in general indicate that no significant reduction in yield was caused by the latent strains of virus X used, the tendency being rather towards an increase in yield as a result of infection.

BARIBEAU (B.) & GAGNON (R.). **L'indexage des Pommes de terre de semence.** [Tuber-indexing of seed Potatoes.]—Reprinted from *Agriculture*, [? *Quebec*], iii, 2, 15 pp., 8 figs., 1 diag., 1946.

In this paper the authors give a full account in popular terms of the tuber-indexing method for the control of potato mosaic, leaf roll, and other virus diseases [*R.A.M.*, xiv, p. 714; xvii, p. 615], together with brief details of the use made of the method in Quebec in recent years. In 1938–9, 584 seed-potato tubers were indexed and mosaic in the resultant crops averaged 14·9 per cent. The following season 29,381 tubers were indexed and mosaic averaged 6·4 and leaf roll 0·5 per cent. In 1944–5, 27,028 tubers were indexed and mosaic and leaf roll averaged 3·1 and 2·6 per cent. respectively. Each year about 70 per cent. of the indexed tubers are derived from seed not indexed the year before. If such had not been the case, the percentage of virus disease that developed would have been reduced by over two-thirds. In the spring of each year, the indexed, healthy tubers are returned to the producer who plants them in plots, using the isolated tuber method. During the summer, each unit in every plot is carefully inspected two or three times, and all diseased and doubtful units are destroyed. The results show that in 1943, 33 per cent. of the plots were placed in the 'foundation' category (seed potatoes being placed in three categories with respect of amount of disease tolerated: 'foundation', 'foundation A', and 'certified'), the figures for the next two years being 60 and 75 per cent. respectively. The total production of potatoes from indexed tubers was expected to exceed 3,000 minots [1 minot = 39 l.] in 1945.

Details are given of an official scheme by which indexed tubers are to be multiplied by the establishment of centres of production of certified seed of the 'foundation' category.

[A shorter version of this paper appears in *Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 29–37, 7 figs., ? 1947.]

GÉNÉREUX (H.). **Désinfection du sol dans le but de lutter contre la gale commune des Pommes de terre.** [Soil disinfection with a view to controlling common scab of Potatoes.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 89–93, [? 1947].

In Quebec, potato scab [*Actinomyces scabies*: *R.A.M.*, xxv, p. 521; xxvi, p. 77] is a serious problem in the plain of Montreal, particularly in the vicinity of the Ile-Jésus and Napierville. In 1934, 1935, and 1936, a survey of 15 fields in this locality showed, respectively, 92·3, 88, and 93 per cent. affected tubers. It was also found that (1) tubers dug before 20th August showed very little infection, (2) soils with pH under 5·5 invariably gave only slight infection, (3) soils containing free lime favour the disease, (4) the use of fresh horse dung increases severity, (5) well-drained fields showed more scab than poorly drained, (6) grey soils showed more disease than yellow ones and yellow more than black, (7) scab was more serious in light than in heavy soils, and (8) the percentage of tubers affected varied little

during the three years but the degree of infection on the individual tubers varied greatly, such variations bearing no relation to temperature.

Soil-disinfection experiments were conducted near Montreal from 1937 to 1942 inclusive in 44 fields, the chief treatments applied being yellow mercuric oxide ($2\frac{1}{2}$, 5, and 10 lb. per acre), calomel [mercurous chloride] (5 to 10 lb.), and sulphur (750 lb.). These materials were applied to the rows by hand just before planting. The average yields (saleable potatoes with not more than 1 per cent. scab in minots per acre [1 minot = 39 l.]) for the years 1937 to 1939 were, untreated control 81·2; mercuric oxide+celite [ibid., xviii, p. 728] 5 lb., 118·1; mercurous chloride+celite 5 lb., 120·1; mercurous chloride 10 lb.+celite, 130·3; mercurous chloride 10 lb.+fertilizer, 130·9; and sulphur 750 lb., 108·8; while for 1940, 1941, and 1942 together, the figures were, control, 81·4; mercuric oxide $2\frac{1}{2}$ lb.+celite, 88·2; mercuric oxide 5 lb.+celite, 89·7; mercuric oxide 5 lb.+fertilizer, 87·2; mercurous chloride 5 lb.+fertilizer, 83·7; mercuric oxide 10 lb.+fertilizer, 78·1; and sulphur 750 lb., 92·9.

These results show that on the whole soil disinfection proved satisfactory during the first three years and less so during the second three. In some soils the mercury compounds favoured infection; sulphur gave promising results, but sometimes reduced yields.

Laboratory tests demonstrated that mercury compounds become reduced in soils to metallic mercury [ibid., xxiv, p. 199] which passes through the soil by diffusion in a volatile form; hence, any factor impeding the reduction of mercury compounds would arrest the action of the mercury [ibid., xxv, p. 361].

In further experiments over two years, eight strongly alkaline soils treated with 5 lb. mercurous chloride per acre and the same+sulphur [quantity unspecified] averaged, respectively, 1·79 and 1·11 per cent. scab, as against 5·5 per cent. for the untreated control. This result indicates that acidity-promoting conditions to some extent reduce scab in the presence of mercury compounds.

ROGER (L.). **Les champignons à sclérotes parasites du Riz.** [Sclerotial fungi parasitic on Rice.]—*Bull. écon. Indochine*, vi, 1–5, 302 pp., 14 pl., 17 graphs, 1942. [Received April, 1947.]

In this work the author presents the results of a series of very detailed investigations carried out from 1938 to 1941 in Cochin-China on the group of rice diseases known as 'tiem' or 'weakening' and associated with a number of fungi, all of which form sclerotia. The first part (pp. 1–38) outlines the problem and the methods pursued and lists the fungi studied, the second (pp. 39–255) gives a detailed account of the organisms concerned treated systematically, and the third (pp. 256–296) deals with specific determinations, studies of comparative pathogenicity, and control methods.

'Tiem', initiated by unfavourable environmental and biological conditions resulting from defective irrigation, is associated with *Corticium rolfsii* [*R.A.M.*, xvi, p. 405], *C. centrifugum* [loc. cit.], *C. solani* [ibid., xx, p. 423], *Hypochnus* [*C.*] *sasakii* [ibid., xviii, p. 617], *Leptosphaeria salvinii* (and its mycelial state *Sclerotium oryzae sativae*) [ibid., xix, p. 615; xxiv, p. 247], *S. oryzae* var. *irregulare* n.var., *S. fumigatum* [ibid., xiv, p. 652], *S. delphinii* [ibid., xiii, p. 387 *et passim*], *S. hydrophilum*, *S. coffeicola* [ibid., xix, p. 326], *S. japonicum*, *Rhizoctonia microsclerotia* [ibid., xix, p. 301], *R. oryzae* [ibid., xx, p. 423], *R. zeae*, and *R. destruens*. Of these, *S. delphinii*, *S. coffeicola*, *R. zeae*, and *R. destruens* become parasitic on rice only accidentally, while *S. japonicum* becomes so on experimental inoculation.

S. oryzae sensu lato comprises two distinct groups of fungi. One contains *Leptosphaeria salvinii*, stat. conid. *Helminthosporium sigmoideum* Cav. [ibid., xi, p. 469; xiv, p. 119], and stat. mycel. *S. oryzae* 'type'. *H. sigmoideum* var. *microsphaerioides* Nakata is considered synonymous with *H. sigmoideum*. The second

group consists of *H. sigmoideum* var. *irregulare* [ibid., xv, p. 47], which is synonymous with *H. sigmoideum* Nakata (non Cav.), and its sterile form *S. oryzae* var. *irregulare*, synonyms of which are *S. microsphaerioides* Nakata, *S. oryzae* (Park's 'A' strain) [ibid., xv, p. 114], and *Sclerotium* Sakurai no. 3 [ibid., xv, p. 49]; the perfect state has not been found.

C. sasakii is synonymous with *S. irregulare* Miyake. *R. microsclerotia* Matz is synonymous with *Sclerotium* Sakurai no. 2 [loc. cit.] and very probably with *S. sphaerioides* Nakata; it is identical with Park's 'B' strain of *R.* [*Corticium*] *solani* [ibid., xv, p. 114] (confirmed by Matz) and Mundkur's non-chromogenic 'A' strain of *S. oryzae* [ibid., xv, p. 313]. Some writers assimilate *S. sakurai* no. 2 with *S. sphaerioides* and make them into a group rather different from the *R. microsclerotia* type. Park's 'A' strain of *C. solani* probably belongs to that species. According to Whetzel *C. centrifugum* is synonymous with *C. rolfsii*; while Bertus considers that *R. destruens* is also the same as *C. rolfsii*. *R. zeae* is close to *R. oryzae*.

Keys are given for identifying the mycelial forms by means of their cultural characters, colorimetric reactions, and sclerotial size and anatomy.

A full, detailed study is presented of the cultural, morphological, anatomical, physiological, and biological characters of the more important of these organisms, somewhat briefer treatment being accorded to *S. delphinii*, *S. hydrophilum*, *S. coffeicola*, and *S. japanicum*, which are all of minor importance. Under local conditions, the most virulent were ascertained to be *L. salvinii*, *C. rolfsii*, and *C. solani*. The only feasible method of controlling 'tiem' is to improve drainage, all other methods being only palliatives. Burning infected haulms after harvest is recommended. The practice of flooding the rice fields between two crops is useless and should be abandoned. The soil should, however, be kept damp but well aerated. One of the three following methods, depending on the local conditions, should be adopted: (1) maintain a low, constant soil humidity between two harvests; (2) maintain humidity for two months, then allow as long a drying period as possible; (3) after maintaining humidity for two months, allow complete and prolonged flooding. Rotation, where possible, would help. The ideal method would be to avoid stagnant water by instituting hydraulic arrangements which would permit water to be let in or out at any time desired. Planting methods should be such that the critical phases of vegetation never coincide with unfavourable climatic conditions (15th August to 15th September, locally). In some cases it would be advantageous to grow early varieties. In the nurseries the plants are too thickly sown. Once infection has taken place the water should be run off completely and not used again. Irrigation should then be repeated with clear water several times. The effects of these measures are, of course, not lasting, and they must be re-applied continually.

HONIG (P.), VOLLEMA (J. S.), & KORTLEVEN (J.). **Selectie van Hevea.** [*Hevea* selection.]—*Chron. Natur.*, ciii, 5, pp. 63–67, 1947. [English summary.]

Particulars are given of the methods and results of the systematic selection of *Hevea* rubber for resistance to South American leaf blight (*Dothidella* [*Melanopsammopsis*] *ulei*) [*R.A.M.*, xxvi, pp. 29, 334, 417], now in progress at the Paramaribo Agricultural Experiment Station, Surinam, under the guidance of Professor G. Stahel in co-operation with the United States Department of Agriculture. Very promising material for breeding has been developed from *H. viridis*, indigenous in the region extending from Rio Negro to the Cassiquiare, Brazil, while two other species from eastern Brazil, *H. paludosa* and *H. minor*, are also to be included in the investigation.

M. ulei, hitherto regarded as an obligate parasite, is stated to have been grown in pure culture on malt agar supplemented by a decoction of young rubber leaves boiled for 30 minutes at the rate of 50 gm. per l.

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ROGER (L.). **Sur un chancre de l'Hévéa en Cochinchine et au Cambodge : le chancre coloré dû au Pythium complectens Braun.** [On a canker of *Hevea* in Cochin-China and Cambodia: the coloured canker due to *Pythium complectens* Braun.]—11 pp., 2 pl., Hanoi, Institut des Recherches agronomiques et forestières de l'Indochine, 1940. [Received April, 1947.]

This study on infection of *Hevea* rubber in Indo-China by *Pythium complectens* [*P. vexans*] is the full account of work already noticed from another source [*R.A.M.*, xx, p. 321].

MARTIN (W. J.). **Diseases of the Hevea Rubber tree in Mexico, 1943–1946.**—*Plant Dis. Reptr*, xxxi, 4, pp. 155–158, 1947. [Mimeographed.]

As the result of a survey carried out by the Rubber Plant Investigations Division of the United States Department of Agriculture, the following diseases were recorded in *Hevea* rubber plantations in the states of Veracruz, Tabasco, and Chiapas in southern Mexico.

South American leaf blight (*Dothidella* [*Melanopsammopsis*] *ulei*) [*R.A.M.*, xxiii, p. 80; xxvi, p. 416] was first observed near Teapa, Tabasco, in September, 1946 and later was found in most plantings. Bird's eye spot (*Helminthosporium heveae*) [ibid., xxv, p. 358] was prevalent on young nursery seedlings during the dry season.

Leaf spots were caused by *Phyllosticta* sp. [ibid., xviii, p. 579], which affected occasional nursery plants rather severely; *Glomerella cingulata* [ibid., vii, p. 186], apparent on nursery seedlings throughout the year but not causing much damage; *Periconia heveae* [ibid., xxv, p. 9], found in one instance generally throughout a small nursery, causing some damage; an undescribed leaf spot due to an *Alternaria* sp., which caused considerable defoliation on clone GA–1279 in budwood gardens at El Palmar, Veracruz, in 1946; a *Didymella* sp. on seedlings; and *Cephaleuros virescens* [ibid., iii, p. 478], common on old plants, and causing relatively little damage.

Pink disease (*Corticium salmonicolor*) [ibid., xxvi, p. 28] was quite prevalent during a rainy spell in a three-year-old seedling nursery at El Palmar in 1945. Die-back of young budded shoots (*Phytophthora* sp.) [ibid., xxi, pp. 42 and 323] affected a considerable number of young budded plants growing under very shaded conditions during a rainy period in September 1944. Sunscald [ibid., xxiii, p. 148] killed a number of nursery seedlings. Mouldy rot (*Ceratostomella fimbriata*) [ibid., xxv, p. 96] was the most destructive disease in old plantations at El Palmar. It caused great damage during the rainy seasons and was always present on some of the trees. The only promising control was obtained by using a fungicidal paste containing spergon. Of many other fungi isolated from diseased panels only a species of *Fusarium*, when tested, was found to be pathogenic, but only slightly so compared with *C. fimbriata*.

Root disease caused by *Helicobasidium* sp. [cf. ibid., xviii, p. 546] was destructive in isolated sections of seedling nurseries at El Palmar in 1943 and 1944. But the

average loss was less than 0·1 per cent. The tap roots of affected seedlings wilt and die during the dry season. The typical mycelial mat type of fruiting structure was formed at or just above the soil line during the latter part of the rainy season. As a result of white rot disease (*Polyporus* [*Fomes*] *lignosus*) [ibid., xxv, p. 358] about 2 per cent. of the plants in a two-acre experimental planting had to be removed by the end of the third year at El Palmar. The disease also occurred in nurseries and was prevalent in one planted in 1945.

VAN HELL (W. F.). **De natuurwetenschappelijke Instituten tijdens den bezettingstijd. Kort overzicht over het Algemeen Proefstation der A.V.R.O.S. gedurende den oorlog.** [The scientific institutes during the occupation period. A brief survey of the General Experiment Station of A.V.R.O.S. during the war.]—*Chron. Natur.*, ciii, 5, pp. 70–73, 1947.

Among the papers published by the A.V.R.O.S. General Experiment Station during the Japanese occupation of Sumatra was one by the author dealing with the root disease caused by *Rigidoporus microporus* [*Fomes lignosus*] in young rubber replantings ($1\frac{1}{2}$ years old). Three years' omission of any kind of attention to the trees resulted in 32 per cent. mortality, half-yearly treatments (without eradication of the old stumps) in 21·8 per cent., and clean-clearing of the entire area in 4·2 per cent. [*R.A.M.*, xix, p. 44].

Ricinus [*communis*], planted on a large scale by the occupying authorities, was found to be suffering from slime disease (*Bacterium* [*Xanthomonas*] *solanacearum*) [ibid., xiii, p. 659].

WALLACE (T.) & HEWITT (E. J.). **Studies in iron deficiency of crops. I. Problems of iron deficiency and the interrelationships of mineral elements in iron nutrition.**—*J. Pomol.*, xxii, 3–4, pp. 153–161, 1947.

Problems relating to iron deficiency in plants [cf. *R.A.M.*, xxv, pp. 98, 119, 124, and next abstract] are discussed with reference to its occurrence in the field and in pot cultures and to the interrelationships existing between iron and various mineral elements. Recent work on the subject is reviewed and correlated. The importance of this deficiency in field conditions lies in the difficulty of controlling it. Soil treatments with iron salts or sulphur, or 'grassing-down' seldom remedy the condition, and resort has to be made to spraying or injection [ibid., xxv, p. 120]. The latter can be applied only to trees, and while effective on apples, causes gumming in stone fruits. Sprays if used at effective rates may injure the trees, and in any case their effects are transient, the iron in the plant tissues being, in cases of iron deficiency, relatively immobile.

In iron-deficiency problems four groups of causal factors operate: (1) where the total supply of iron is insufficient; this probably occurs only in pot cultures, (2) lime-induced chlorosis on calcareous soils [ibid., xxv, p. 586], (3) iron deficiency resulting from other mineral deficiencies, or (4) from excesses or toxicities of other mineral elements.

While manganese has been clearly demonstrated to be antagonistic to iron in solution cultures, this does not seem to be an important factor in lime-induced chlorosis. On acid soils manganese may be toxic to many plants, but a number of the toxic effects appear to be distinct from iron deficiency. The importance of the manganese-iron ratio in inducing iron deficiency in acid soils needs further study.

The chief characteristic of leaves of plants affected by lime-induced chlorosis is their high potassium content and low calcium-potassium ratio. The evidence suggests that this results from the chlorosis. Iron deficiency may be brought about by potassium deficiency, but a distinction must be made between simple potassium deficiency, which may induce iron deficiency, and cases where deficiencies

of the two elements arise simultaneously but are causally unrelated. Phosphorus commonly induces iron deficiency in solution cultures and may do so in neutral and slightly alkaline soil conditions, though it seems less likely to be an important factor in acid soils. Iron and zinc show antagonism, and zinc may cause iron deficiency in solution cultures and soils, particularly in acid soils. Iron and copper also display antagonism, and copper may affect the availability of both iron and manganese to plants. Cobalt may also cause iron deficiency, and iron nutrition appears to be affected by the magnesium status and calcium-potassium ratio in the nutrient medium. Iron deficiency results in the presence of high proportions of soluble nitrogen in the leaves of plants. It appears that not only the availability of the iron but also the factors governing its absorption into and mobility within the plant are important.

KEYWORTH (W. G.) & DAVIES (D. L. G.). **Nettlehead disease of the Hop.**—*J. Pomol.*, xxii, 3–4, pp. 134–139, 1 pl., 2 figs., 1947.

In this account of investigations into the graft transmission of nettlehead virus disease of hops [*R.A.M.*, iv, p. 634; xxiv, p. 287] and its incidence in commercial plantations, the authors state that affected plants first become distinguishable in April and May, shortly after the bines begin to grow. On such plants the bines are rigid and the internodes shortened. The leaves stand out stiffly and the edges are curled upwards. When the bines are thinned and trained up the strings the contrast between healthy and nettlehead plants becomes less evident. As the bines grow, however, the leaf-curl symptoms again become visible, while the bines lose their ability to climb and fall away from the strings. They become brittle and turn a dull yellowish-brown. The basal lobes of the new leaves are small or lacking, and thus resemble those of nettles. Their lower surfaces are greyish and the veins are prominent with short translucent portions. The bines die back from the tips, there is often marked veinbanding, and the leaves then turn yellow and die. On severely affected hops the cones are few and small, but on others the crop may approximate to normal, though the bracts and bracteoles are usually distorted. The disease weakens the plant year by year; the centre of the stock rots and the new buds are confined to a thin rim of living tissue. On plants growing at high temperatures the symptoms are less conspicuous.

Field and greenhouse grafting experiments were carried out on Fuggles hops, using infected cuttings and complete plants from commercial plantations. The inarching method was used. Eighty grafts were successful, and 89 per cent. of these became infected (27 of 29 in the glasshouse and 44 of 51 in the field), though none of the controls in the glasshouse developed the disease, while 12 per cent. of those in the field were attacked, presumably as a result of natural infection. This result provides conclusive evidence that nettlehead is graft-transmissible. The only control measures that can at present be recommended are the roguing-out of diseased plants and the use of healthy planting stock. Roguing should be started as soon as the first symptoms are seen and should be continued throughout the season. In small outbreaks, all plants next to affected ones should also be removed. Experience has demonstrated that by planting nettlehead-free stock not less than a quarter of a mile distant from neighbouring hops a healthy stand can be maintained for many years.

McMARTIN (A.). **Sugarcane mosaic disease and Maize growing.**—*S. Afr. Sug. J.*, xxxi, 1, p. 35, 1947.

To confirm the suspicion that the maize aphid, *Aphis maidis*, is primarily responsible for the spread of the sugar-cane mosaic virus in Natal [*R.A.M.*, xxvi, p. 215 and next abstract], two small plots, consisting of short lines of healthy Co. 281

alternating with the same variety from infected stools, were planted in fields in different parts of the Mount Edgecombe Experiment Station on 9th November 1946. In one plot maize was interplanted with the cane. By the following 10th January the disease had already begun to spread in the plot interplanted with maize, seven new cases of infection being found which on the 22nd had risen to 14. *A. maidis* was prevalent on the maize, some 40 per cent. of which showed mosaic-like symptoms, and isolated specimens could be detected on the canes. On the other plot no spread had taken place by the 22nd. This experimental demonstration of the risk of growing maize in proximity to sugar-cane lends further weight to the recommendation already made for the avoidance of the practice.

D[ODDS] (H. H.). **The incidence of mosaic disease. Influence of Maize : control measures.**—*S. Afr. Sug. J.*, xxxi, 2, pp. 81–82, 1947.

With further reference to the development of mosaic in the maize and sugar-cane interplanting experiment [see preceding abstract], the number of new cases of infection on sugar-cane in the plot containing maize had risen from 14 on 22nd January 1947 to 19 on the 27th and 26, 44, and 67 on 3rd, 10th, and 17th February, respectively, the corresponding figures for the surrounding cane being 19, 35, 59, and 72, respectively. In and around the plot without maize the cane remained healthy until 10th February, when two cases were observed in the plot itself and one in the vicinity, the corresponding figures on the 17th being three and two, respectively.

In the course of an examination of the Experiment Station fields by D. J. Retief, the Government Disease Inspector, proceeding at the time of writing in February, 1947, the incidence of mosaic was found to have been reduced from 20 per cent. and upwards in the previous season to less than 1 per cent. by the planting of selected cane. The disease was found for the first time on N : Co. 310, N : Co. 291, N : Co. 328, Co. 328, Co. 313, Creole, and B.726.

MAYOR (E.). **Mélanges mycologiques. II.** [Miscellaneous mycological notes. II.] —*Ber. schweiz. bot. Ges.*, lvi, pp. 656–672, 3 figs., 3 graphs, 1946.

In 1940 and 1941 the author observed in the canton of Neuchâtel *Taphrina athyrii* on the living fronds of *Athyrium filix femina*. The fungus causes pale yellow, later very dark brown spots, isolated or confluent, round or elongated, and affecting the whole or part of the leaflet but without causing distortion. The asci, present on both surfaces but usually only on the lower, were hyaline, and measured 12 to 24 by 5 to 8 μ, being wider in the middle. The spores are hyaline and elliptical, and measure 4 to 6 by 3 to 4 μ.

In September 1936, the greater number of some hundreds of *Chrysanthemum cinerariaefolium* plants growing, apparently wild, in a remote part of the canton of Vaud in the defile of the Orbe were found to be infected by *Puccinia gaeumanni* n.sp. Spermogonia were not observed. The primary uredospores were light brown, round or roughly round, 21 to 26 μ in diameter, or oval-elliptical and 26 to 35 by 12 to 26 μ. Three (two to four) germ pores up to 5 μ high are present; the wall is 2 to 3 μ thick, darker brown than the rest of the spore, and finely echinulate. The hyaline stalk measures up to 35 by 5 to 7 μ. The hyaline, filiform paraphyses measure 45 to 70 by 2 to 3 μ.

The secondary uredospores are round, ovoid, or more generally oval-elliptical, light brown, and measure 23 to 33 by 17 to 26 μ. In other respects they resemble the primary uredospores the hyaline pedicel being up to 23 by 4 to 5 μ. The paraphyses also are similar. The oval-elliptical teleutospores, which are rounded at either extremity, often become narrow at the point of insertion of the pedicel; they are not constricted at the septum, or not conspicuously. They measure 33 to 54 by 16 to 28 μ; the upper cell is 16 to 28 by 21 to 28 μ, the corresponding

figures for the lower one being 16 to 28 by 16 to 24 μ. The wall is 2 to 3 μ thick, being up to 9 μ thick at the tip. The hyaline pedicel measures up to 90 (35 to 47) by 4 to 7 μ, and the hyaline, filiform paraphyses measure 45 to 70 by 2 to 3 μ.

All attempts to infect *C. cinerariaefolium* with the teleutospores and uredospores of two other fungi of the same group, viz., *P. balsamitae* and *P. tanaceti*, failed. This result suggests that *P. gaeumanni* is of biological interest.

MOLDENKE (H. N.). **A contribution to our knowledge of the wild and cultivated flora of Pennsylvania.**—*Amer. midl. Nat.*, xxxv, 2, pp. 289–399, 1946.

Fungi are included (pp. 296–303) in this annotated list of over 4,000 collections of Pennsylvanian plants.

MOLDENKE (H. N.). **A contribution to our knowledge of the wild and cultivated flora of Ohio. II.**—*Amer. midl. Nat.*, xxxv, 3, pp. 779–792, 1946.

The 333 collections of Ohio plants represented in this instalment included a number of fungi, which are listed on pp. 781–785.

TENG (S. C.). **Additions to the Myxomycetes and the Carpomycetes of China.**—*Bot. Bull. Acad. sinica*, i, 1, pp. 25–44, 1947.

In this supplement to S. C. and K. L. Teng's 'Contribution to our knowledge of the Myxomycetes of China' (1937), the species not previously reported are described in detail, while the further distribution of those already published is shown in an appendix. The new records include *Sorosporium paspali* [*R.A.M.*, xv, p. 829] on *Paspalum scrobiculatum*, *Puccinia iridis* on *Iris*, *Armillaria mellea* on the base of a living *Salix* trunk, and *Chrysomyxa tsugae-yunnanensis* Teng n.nom. on *Tsuga yunnanensis*. The last-mentioned was described in 1940 as *C. tsugae* [ibid., xxi, p. 45], but this name was found to have been applied previously by Hiratsuka to a different rust on *T. sieboldii* [ibid., xvii, p. 347], necessitating a change in the designation of the author's species.

ROGERS (D. P.). **Fungi of the Marshall Islands, Central Pacific Ocean.**—*Pacif. Sci.*, i, 2, pp. 92–107, 2 figs., 1947.

This is an annotated list of 34 species of fungi, of which two are new, collected on the Marshall Islands in the Pacific Ocean during 1946 by an expedition from the University of Hawaii. Further reports are expected to be issued.

VELENOVSKÝ (J.). **Novitates mycologicae novissimae.** [The latest new mycological finds.]—Botanical Society of Czechoslovakia, Prague, 158 pp., 1 pl., 1947.

This contribution (Volume IV of 'Opera Botanica Čechica') to the study of Czechoslovakian Discomycetes (60 pp.) and Basidiomycetes, chiefly Agaricaceae (74 pp.) and a few Polyporaceae, Clavariaceae, and Gasteromycetes, comprises Latin descriptions of genera and species, several of the former and a very large number of the latter being new.

TEIXEIRA (A. R.). **Himenomicetos brasileiros. III (Agaricaceae).** [Brazilian Hymenomycetes. III (Agaricaceae).]—*Bragantia, S. Paulo*, vi, 4, pp. 165–188, 10 pl., 1946.

In this further contribution to the knowledge of Brazilian Hymenomycetes [cf. *R.A.M.*, xxvi, p. 81] the author records the occurrence of *Schizophyllum alneum* [*S. commune*] on a number of plants, including *Achras sapota*, birch (*Betula papyrifera*), orange, coffee, persimmon (*Diospyros*) [*kaki*], *Eucalyptus*, cotton, *Jatropha*

curcas, *Liquidambar* sp., cassava, sugar-cane, and cacao, and lists five species of *Lentinus* (one new) with critical annotations.

BATKO (S.). **Biometrical researches of secondary spores and a study of the mycelium of Pholiota adiposa Fr., P. heteroclita Fr., P. mutabilis (Schaeff.) Fr., P. spectabilis Fr., and P. squarrosa (Müll.) Fr.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 242–249, 1 fig., 1946.

The secondary spores [conidia] of five species of *Pholiota* are described, with a discussion of the statistical significance of their differences in size. In *P. adiposa* [*R.A.M.*, xxi, p. 59; xxiv, p. 169] these organs on both the aerial and submerged mycelium were ellipsoidal, ovate or almost orbicular, with thin walls and crystals. The mean length (100 spores) was 6·5 and the mean breadth 4·1 μ of the aerial ones and 6·2 and 4·2 μ of the submerged. In *P. heteroclita* and *P. mutabilis* [ibid., xxi, p. 58] no conidia formed. In *P. spectabilis* the conidia on the aerial mycelium were almost orbicular, and about half of them had walls 1 to 2 μ thick; those on the submerged mycelium were thin-walled. The mean measurements of the former were 12·1 by 10·9 μ and of the latter 15·3 by 13·9 μ, while the conidia on hyphae in wood were 11·8 by 10·5 μ. In *P. squarrosa* [ibid., xviii, p. 360] aerial conidia were very rare; on the submerged mycelium they were 11·9 by 5·9 μ, thin-walled and variable in form, usually pear-shaped, though others were ellipsoidal or orbicular, and some narrowed in the middle.

Differences in the mean measurements of the secondary spores as between the different species were all found to be statistically significant, except for the difference between the mean length of those of *P. spectabilis* on the aerial mycelium or in wood and the length of those of *P. squarrosa*.

MATSUMOTO (T.). **Tobacco diseases in Formosa.**—*Mem. Fac. Agric. Taiwan Univ.*, i, 1, pp. 1–26, 11 pl. (1 col.), 1946.

The author has been engaged since 1939 on the investigation of tobacco diseases in Formosa, where the crop is of major importance. Present on the island are the tobacco mosaic, necrosis, ring spot, and leaf-curl viruses, while a composite disease observed under glass is thought to be identical with the double-virus streak of tomato [mixed-virus tomato streak caused by tobacco mosaic virus+potato virus X: *R.A.M.*, xvii, p. 73; cf. also xxvi, p. 84].

Bacterial diseases comprise Granville wilt (*Bacterium* [*Xanthomonas*] *solanacearum*, hollow stalk (*Bacillus* [*Erwinia*] *aroideae*) [ibid., vii, p. 121], and (?) wildfire [?*Pseudomonas tabacum*]: at the time of writing the organism had not been isolated from the brown spots with a yellowish halo, so its exact determination must await further investigation. According to Okabe's investigations in Formosa (*Bull. Sch. Agric. For. Taikoku*, iii, pp. 50–65, 1942), *X. solanacearum* falls into at least four distinct types, viz., F, Op, C, and SS, differing in colony characters. Inoculations with F and SS result, after about ten days, in the destruction of the pith and consequent formation of central cavities, while Op and C cause the death of the plants in about a fortnight without any preceding discoloration of the pith. The mild type C tends to be converted in the host tissues into the virulent F, with a corresponding change in the symptoms.

The crop is affected by the following fungal diseases: damping-off (*Pythium debaryanum*), black shank (*Phytophthora nicotianae*), powdery mildew, caused by *Erysiphe tabaci* Saw. [*R.A.M.*, viii, p. 199] (syn. *E. cichoracearum* p.p.), *Sclerotinia* disease (*S. sclerotiorum*), sore shin, *Corticium vagum* (*Rhizoctonia* [*C.*] *solani*), frog eye (*Cercospora nicotianae*), *Alternaria* leaf spot, attributed by Sawada [loc. cit.] to *A. tabacina* but regarded by Takimoto (*J. Plant Prot.*, xxi, pp. 494–500, 1934) as due to *A. longipes* aff.; anthracnose (*Colletotrichum* ? *tabacum* Böning) [cf. *R.A.M.*,

xi, p. 753], and sooty mould (*Fumago vagans*). In the author's experience, much of the damage commonly ascribed to *P. nicotianae* is actually caused by *X. solanacearum*, but further studies are necessary to determine the relative importance of the two pathogens in connexion with black shank. Evidence has been obtained of extensive physiologic specialization in *Corticium solani* [cf. ibid., xx, p. 591], the strains isolated by the writer from tobacco, cotton, and castor bean [*Ricinus communis*] differing more or less widely in morphological and physiological features, as also did Okabe's isolate from *Stephania cepharanta*. Takimoto has shown that in Japan the greyish-white lesions produced on the leaves by *Cercospora nicotianae* are readily distinguishable from the reddish-brown areas typical of infection by *Alternaria*. In Formosa, however, the brownish spotting associated with the former species is very liable to confusion with the symptoms of the latter. Pending availability of the original descriptions of *Colletotrichum nicotianae* Averna-Sacca and *C. tabacum* Böning [ibid., viii, p. 680], the agent of anthracnose in Formosa cannot be determined with certainty, and its provisional attribution to the latter species rests on Sawada's record in part XI of his 'Descriptive catalogue of Formosan fungi' (not yet published). The local strains differ in their temperature relations, one procured from the north-east, for instance, growing fairly well between 25° and 31° C., with an optimum at 28°, while Hirane's isolate from the south of the island (*Tabako Kenkyu-shiro*, xi, pp. 53–59, 1943) developed better at 31° than at 28°, and the Japanese collections of Takimoto (*J. Plant Prot.*, xxi, pp. 574–579, 1934) and Nakamura (*Bull. Hatano Exp. Sta.* 33, pp. 54–71, 1934) flourished at 27° and 25°, respectively.

Non-parasitic disorders include frenching [*R.A.M.*, xxv, p. 334], nitrogen and potash deficiency (ibid., xvi, p. 781], and albinism, characterized by the development on the leaves, and occasionally on the stems, of large, irregular creamy-white or pale greenish-yellow areas.

Cuzin (J.), Renier (A.), & Schwartz (D.). **Epidémiologie statistique de la mosaïque du Tabac.** [Statistical epidemiology of Tobacco mosaic.]—*C.R. Acad. Sci., Paris*, ccxxiv, 22, pp. 1579–1581, 1947.

This is a description of a method applied by the authors at the Tobacco Institute, Bergerac (Dordogne) over a three-year period to the statistical assessment of the incidence of the tobacco mosaic virus, which was shown experimentally to persist in the soil [see next abstract]. Attention was directed chiefly to the topographical distribution of the diseased plants, which fell into two well-marked categories, endemic and epidemic, the former represented by random infection appearing sporadically throughout the field, and the latter by definite foci connected in some way, as yet unexplained, with the performance of transplanting operations.

Bordeleau (R.). **La mosaïque du Tabac hiverne-t-elle dans nos sols?** [Does Tobacco mosaic overwinter in our soils?].—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 80–83, [? 1947].

In June, 1941, three plots were planted with tobacco at the Experiment Station, Assomption, Quebec, and at the Substation at St. Thomas. When the plants were 18 in. high they were inoculated with tobacco mosaic by [rubbing with] affected leaves, and a few days later 100 per cent. of the plants at Assomption had developed mosaic symptoms. In the autumn the plants in plot one were dug in to a depth of 6 or 7 in.; in plot two they were uprooted whole and stored in a frost-proof place; in the third they were left lying on the ground.

In the spring (1942) samples of the plants and soil were analysed by G. H. Berkeley at the Dominion Laboratory of Plant Pathology, St. Catherine's, Ontario. The Assomption material showed that in plot three the virus was present in quantity in the surface soil [*R.A.M.*, ix, p. 207; xvii, p. 139] and also in the subsoil (8 to

10 in. below the surface) between the rows, it was present to a slight extent on the surface and in the subsoil near the roots, it was abundantly present in the stems and leaves, and even more so in the roots. In plot one it was rare in the surface soil and subsoil near the plants, and between the rows, and rather weakly present in the roots, stems, and leaves. In plot two it was very rare in the soil surface, though rather strongly present in the plants.

In the spring of 1942, healthy tobacco was planted in the three plots at Assomption, the plot where the plants had been left lying on the ground being disked; a fourth plot on which the remaining plants from indoors had been spread and disked into the soil was also planted. Precautions were taken against introduction of the disease from other sources. In autumn, these four plots showed, respectively, 6·9, 1·4, 1·4, and 15·2 per cent. mosaic-affected plants.

In 1942, new plots were planted at both sites and inoculations were 100 per cent. successful. In the autumn, the following treatments were carried out: plot 1, whole plants dug in, plot 2, whole plants disked in, plot 3, whole plants uprooted and left to dry in a place where they were exposed to winter temperatures, plot 4, plants left to winter on the ground and disked in the spring of 1943, plot 5, plants uprooted from plot 3, incorporated in the soil by disking in the spring. At Assomption, soil specimens from plots 1, 2, 3, and 4 were, respectively, negative, positive (trace), negative, and positive for the presence of the virus, the plant remains from the same plots being, respectively, positive, positive, positive, and negative, and the number of clean tobacco plants planted in June contracting mosaic being, respectively, 23, 15·7, 4·7, 40·5 per cent., and for plot 5, 36·6 cent. At St. Thomas, analysis of soil and plant remains from all plots gave positive results except in the case of the plants left on the ground, the clean plants in the plots corresponding to the Assomption experiment contracting 1, 0, 1·9, 7·6, and 8·7 per cent. mosaic, respectively. Further work is in progress.

When tobacco is planted following tobacco, therefore, there is a risk of maintaining or increasing mosaic [ibid., xix, p. 371], whatever precautions may be taken to reduce it. Rotation should be an important means of control; when tobacco followed tobacco for several years nearly 9 per cent. mosaic resulted, though the figure was under 1 per cent. when rotation was practised.

Selman (I. W.). **The localization of Tobacco mosaic virus in Tomato fruits.**—*J. Pomol.*, xxii, 3–4, pp. 226–230, 1 fig., 1947.

Tomato plants in the 13- to 14-leaf stage with the second truss in bud, growing in the ground under glass, were inoculated with yellow mosaic virus [a strain of tobacco mosaic virus] on 29th May, 1946, by wiping the terminal leaflet immediately below the first truss with infective juice. On 2nd July, 22 of 112 inoculated plants appeared to be virus-free, but when the inoculated leaflets were tested for virus it was found that only 17 were virus-free; one contained yellow mosaic, and four some virus in a very low concentration. On 16th July, when eight trusses had developed, tests were made again on the same 22 plants. Of the four plants previously found to contain little virus in the inoculated leaflet, one had virus in the first-formed fruit of the lowest truss, though none had any in the young leaves. Examination of the green fruits on the yellow mosaic plant showed that those on one fork of the second truss contained virus and bore whitish blotches characteristic of yellow mosaic. Fruits of the first truss also contained the virus but appeared to be normal, while the terminal shoot above the eighth truss was without virus.

In 1945, potted tomatoes were inoculated in the same way with the yellow mosaic strain at the 18-leaf stage (three trusses in bud). Five weeks later, brown lesions developed on four green fruits of the lowest truss of one plant, though main and lateral shoots showed no sign of virus and tests on these shoots were negative. The pitted fruits were found to contain a green-mottle strain of tobacco mosaic, the

origin of this infection being obscure. The plant was stopped between the fifth and sixth trusses on 20th June, and on 14th July a top lateral shoot showed symptoms of yellow mosaic. It was concluded that a light infection of tobacco mosaic had been localized in the fruits of the lowest truss.

In order to test this hypothesis potted Potentate tomato plants in the three-truss stage on 17th April received the following treatments: (1) all trusses removed, no inoculation; (2) trusses left on, no inoculation; (3) all trusses removed, leaflet below first truss inoculated with diluted juice containing mild tobacco mosaic virus; (4) trusses left, similar inoculation; (5) all trusses removed, leaflet above first truss inoculated; (6) trusses left, leaflet inoculated as in (5). In those plants where a mosaic mottling in the tops became apparent within 19 days after inoculation the evidence indicated that the systemic spread of tobacco mosaic virus from the lower leaves to the main leafy shoot may be delayed six to ten days by the presence of developing fruit. On 15th May, eight of the inoculated plants, all with trusses present, in which mosaic symptoms had not been noted were tested and the virus was detected in the fruit of the lowest truss of all, and in the young leaves of all but two. The uninoculated plants with trusses also contained the virus in the oldest fruits of all and in the young leaves of all the plants except one. It is concluded that when tomato leaf juice infected with tobacco mosaic virus or the yellow mosaic strain is diluted with more than three times its volume of water and wiped on to single leaflets the virus becomes localized in the developing fruits.

CHAMBERLAIN (E. E.). **Tomato-streak. Its incidence in New Zealand and identity with single virus streak (Lycopersicum virus 1 of Smith, 1937—a strain of Tobacco-mosaic virus).**—*N.Z. J. Sci. Tech.*, A, xxviii, 4, pp. 225–233, 4 figs., 1946.

Tomato streak has been shown to be identical with single-virus streak, a strain of the tobacco mosaic virus [*R.A.M.*, xxiv, p. 493]. The incidence of the disease in individual crops in New Zealand may reach 70 per cent.: a survey of 54 glasshouse stands comprising over 200,000 plants in six districts revealed an average infection of 2·3 per cent. Under experimental conditions, transmission to tomatoes results almost invariably in the development of mosaic symptoms only. The physical properties of the tomato streak and tobacco mosaic viruses are in complete agreement and their host ranges are closely similar, but the two viruses may be differentiated by the symptoms they induce on tobacco, those of the former consisting of local lesions, sometimes followed by systemic necrosis. It is proposed to re-name the tomato streak virus '*Lycopersicum* virus 1 of Smith (1937)—a strain of tobacco mosaic virus'.

PELLETIER (R.). **Études préliminaires sur l'effet de certains arrosages appliqués dans le champ en vue de lutter contre l'anthracnose et le mildiou du fruit de la Tomate.** [Preliminary studies on the effect of certain spray treatments applied in the field for the control of anthracnose and mildew of Tomato fruits.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 94–98, 3 graphs, [? 1947].

In an experiment carried out in Quebec in 1943, John Baer tomato plants were sprayed on 15th July with a spore suspension of *Alternaria solani* and on 20th July with a mixed suspension of the spores of *A. solani* and *Colletotrichum phomoides*. One lot received two applications of Bordeaux mixture (2–2–32) followed by four at 4–4–32; a second (designated fermate I) received six applications of fermate (2–80); and a third (fermate II) three applications at the same concentration. In the case of the Bordeaux mixture and fermate I the quantities applied were 80 to 90 gals. per acre for each of the first two applications (29th July and 12th August), 140 to 150 for the next three (25th August, 6th and 15th September), and 80 to 90 for the final one (6th October); the applications of fermate II were at

the same rates as the last three applications of fermate I and were given on the same dates.

The results obtained showed that against all the diseases that developed (*C. phomoides*, *Phytophthora infestans*, *A. solani*, *Oospora lactis*, *Rhizopus* spp., etc.), considered generally the best treatment was the Bordeaux; against *C. phomoides* only [see next abstract] fermate I was best; against *P. infestans* [*R.A.M.*, xxvi, p. 220] the Bordeaux treatment was most satisfactory, fermate appearing to increase infection. Further work is in progress.

WILSON (J. D.). **Anthracnose and its effect on Tomato varieties.**—*Food Packer*, xxviii, 6, pp. 65–67, 1 fig., 1947.

A three-year study at the Ohio Agricultural Experiment Station on varietal reaction to tomato anthracnose [*Colletotrichum phomoides*: *R.A.M.*, xxvi, pp. 36, 220, and preceding abstract] is reported. In 1944, when the disease was of moderate severity, Earliana proved to be the most susceptible with 43·4 per cent. infection, followed by Victor (34·5), a group of six with 20 to 25 per cent., another group comprising Baltimore, Cobourg, and Rutgers (16 to 19), and John Baer (14·2). There was comparatively little infection in 1945, when the maximum of 21·8 per cent. occurred on Bounty. Fordhook Hybrid and Ponderosa were the only other varieties with more than 10 per cent., Cobourg showed 10 per cent., and a group including Baltimore, Marglobe, Pritchard, Scarlet Dawn, Stone, Valiant, and Jubilee less than 5, the last-named being the least affected (3). Of the 48 varieties tested in 1946, the most susceptible (in descending order) were Bison, Bounty, Earliana, Burbank, and Grothen's Globe, and the most resistant (in an ascending scale) Gold Ball, New Stone, Dwarf Stone, Jubilee, and Stokesdale. As a group, the ten pink varieties were the most susceptible (25 per cent. average infection), followed by the 33 red (17·2), and four yellow (8·7).

Fruits produced on vines of determinate growth were more susceptible than those on well-developed, indeterminate plants (an average of 41·5 per cent. on six determinate varieties compared with only 11·6 on six indeterminate ones).

The average infection on six of the earliest varieties was 30 per cent., as against only 13 on another group maturing later. On yet another group of six varieties with relatively sparse and open foliage, 38 per cent. of the fruits were diseased compared with only 18 on six with dense, heavy foliage. In a further test comparing 14 varieties almost or wholly defoliated on 15th September with the same number retaining about half their leaves, the former showed 41 and the latter 24 per cent. for the entire season and yield increases from spraying were 67 and 36 per cent., respectively. It would appear from these observations that susceptibility to anthracnose is enhanced by excessive exposure to sunlight and early contact with the soil. Sunburned fruits tend to develop myriads of small cracks, and the epidermis and its protective cuticle may be worn thin by soil abrasion or biological and chemical action, facilitating the entry of the fungus.

The average degree of anthracnose control obtained by spraying all 48 varieties with zerlate in 1946 was 84 per cent., while the average yield of saleable fruit was increased from 5·2 to 8·2 tons. Of five popular commercial varieties included in all three years' trials, Garden State was the most susceptible, Cobourg second, Stokesdale and Rutgers close thirds, and Baltimore showed the lowest percentage of diseased fruits. In the case of Garden State, infection remained within tolerable limits (an average of 7 per cent. in several experiments) during the first half of the picking season, while the vines were still sufficiently upright to hold most of the fruit off the ground and the foliage cover dense enough to protect it from the sun. During the latter half, however, the infection index increased rapidly (31·8 per cent.). The seasonal increase in infection was only about half as great in the other four popular varieties.

MOORE (W. C.). **Bacterial canker of Tomato in England.**—*J. Minist. Agric.*, liv, 3, pp. 138–142, 2 pl., 1 map, 1947.

This disease caused by *Corynebacterium michiganense* [*R.A.M.*, xxvi, p. 69] was first reported in England in 1942. There were 11 outbreaks in 1944, nine in 1945, and four in 1946, making 36 places in all where it has occurred. The only way of identifying the disease with certainty is to grow out the bacterium from the plants. The organism was found only in some of the specimens taken from the suspected outbreaks from 1942 to 1945, but it became apparent that the disease has its distinguishing symptoms which differ from those of other tomato disorders. The symptoms of marginal browning, curling, and gradual withering of the lower leaves are not peculiar to bacterial canker but the following symptoms are: (*a*) withering and streaking of the leaflets on one side of the petiole while those on the other remain green and turgid; (*b*) the formation of yellow or brown dots in the shape of a horseshoe where an affected leaf is cut off flush with the stem; (*c*) the path of the disease in its early stages can easily be seen as a yellow, light or dark brown streak just inside the woody cylinder if the stem is cut lengthwise; (*d*) yellow or light brown streaks can often be seen inside the maturing fruits running from the stalks to the placenta, from which the bacteria ooze in little, yellow blobs when the fruit is squeezed; and (*e*) the symptom most characteristic but most rare in England is the presence on the fruit of a superficial, circular spot, about $\frac{1}{10}$ in. in diameter, with a raised, brown centre surrounded by a snowy-white halo in its typical form.

So far the loss due to the canker has been insignificant, no more than 2 acres under glass having been infected, which is less than 0·1 per cent. of the average annual area of the indoor crop. The status of the disease as a potential threat to the crop is uncertain but there is no present cause for alarm in glasshouses. The position is different for the outdoor crop as the incidence and severity of the disease vary. On eight farms or nurseries 0·25 to 10 per cent. of the plants were affected, while on one farm in Surrey (1943) 1,100 out of 8,000 plants of Hundred Fold had to be burnt by mid-August. In six of the ten confirmed outbreaks in 1943 the same variety, derived from the same seed source in a country where the disease is well known, was affected and further seed distribution was banned. On the confirmation of the disease in 1943 the following measures were prescribed by the Ministry to prevent its spread. All infected plants, after removal of the fruit, were to be burnt together with string or other tying materials, and stakes used as supports to be sterilized by creosote, steam, or a 2 per cent. formaldehyde solution, no seed from the infested area was to be saved, and no tomatoes grown outdoors on infected land in the following year. These measures were evidently successful as the disease has not reappeared in areas thus treated. In the light of additional knowledge of the disease in 1946, official action ceased and advisory work took its place. Growers should now consult the local N.A.A.S. office if *C. michiganense* is suspected and should act as described above if the disease is confirmed on their premises.

YOUNG (P. A.). **Tomato diseases in Texas.**—*Circ. Tex. agric. Exp. Sta.* 113, 66 pp., 32 figs., 1946.

In this circular, which replaces Nos. 82 and 86 in the same series [*R.A.M.*, xviii, p. 421; xix, p. 372], popular notes are given on the symptoms, causes, and control of 61 fungal, bacterial, virus, and physiological diseases affecting tomatoes in Texas, with a key showing the main symptoms and common names of the more important of them.

MILLER (P. R.). **Warning service for late blight with special reference to Tomato.**—*Plant Dis. Reptr*, xxxi, 4, pp. 140–145, 1947. [Mimeographed.]

Following a resolution recommended at a special Tomato Conference at Indianapolis [*R.A.M.*, xxvi, p. 220], a warning service for late blight [*Phytophthora*

infestans: see next abstracts] was established in February, 1947, by the Plant Disease Survey of the Bureau of Plant Industry. It was designed primarily with reference to tomato, but it will be equally important to observe the potato crop, because of the reciprocal effect of the two hosts in the spread of the disease. Key pathologists, a list of whom is provided, send brief weekly reports on essential facts, such as dates and places of earliest appearance, weather of past week, spread to new areas, and losses incurred. The reports are assembled by the Plant Disease Survey into a warning letter and sent immediately to State key reporters. Anyone in a position to give helpful information should report direct to the key man in his State, rather than to the Plant Disease Survey.

SCHROEDER (W. T.). **Orthol K enhances control by zerlate of Phytophthora late blight on Tomato.**—*Plant Dis. Reptr*, xxxi, 5, pp. 191–192, 1947. [Mimeographed.]

In a field experiment at Geneva, New York, during 1946, fermate and zerlate at 2 lb. per 100 gals., with and without the adhesives omilite (polyethylene polysulphide) and orthol K, at 1 and 2 pints per 100 gals., respectively, were used on plots of tomato plants [*R.A.M.*, xxvi, p. 269]. Bordeaux (8–4–100) and non-sprayed plots served as controls. Four applications were made. Late blight (*Phytophthora infestans*) [see preceding abstract] appeared on the foliage of the non-sprayed plots at the time of the second application and continued to develop at a devastating rate, accounting for virtually all the reduced yield. The plants treated with Bordeaux yielded 20 tons per acre, with 5 per cent. infected fruit. The corresponding figures for zerlate with orthol K were 13·9 tons and 26 per cent. and without adhesive 4·4 tons and 72 per cent., respectively. All treatments gave significantly better results than the controls (2·2 tons and 78 per cent.).

LINCOLN (R. E.) & SAMSON (R. W.). **Isolation of the Tomato strain of Phytophthora infestans from Potato tubers.**—*Plant Dis. Reptr*, xxxi, 4, pp. 145–146, 1947. [Mimeographed.]

The tomato strain of late blight (*Phytophthora infestans*) [*R.A.M.*, xx, p. 92] was isolated from Chippewa potato tubers grown at the Northern Indiana Experimental Farm at Walkerton, and from (?) White Rose tubers purchased from a store, originating from Caldwell, Idaho. Inoculated into tomato and potato foliage, this strain proved to be extremely virulent on both. The White Rose isolate was of equal or greater virulence compared with a tomato strain sent by Dr. G. Ruehle from diseased tomatoes in Florida, while the Chippewa isolate was less virulent.

POMERLEAU (R.). **Inventaire pathologique de la forêt décidue à la Station Forestière Expérimentale de Duchesnay (Québec).** [A pathological survey of the deciduous forest at the Forestry Experimental Station, Duchesnay, Quebec.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 69–79, [? 1947].

A detailed survey of the deciduous trees at Forestry Experimental Station, Duchesnay, Quebec [*R.A.M.*, xxiv, p. 169], in which 3,147 trees from 10 to over 100 years old were examined, showed that 13·9 per cent. had some form of canker and 21·9 per cent. some form of decay. Most of the cankers were caused by *Nectria* spp., which were not further identified, the fungi responsible in Quebec, being, according to Lohman and Watson, *N. galligena*, *N. mammoidea*, and *N. coccinea* [ibid., xxiii, p. 47]. *Nectria* cankers were most frequent on wild cherries [*Prunus serotina*]; *Acer rubrum* is very susceptible to *N.* spp., followed by birch (*Betula lutea*). On *A. saccharum*, *Eutypella parasitica* [ibid., xxiv, p. 170] causes a form of canker the importance of which is second only to that due to *N.* spp. It is particularly prevalent on young, crowded trees. Cankers due to *Diatrype*

macounii, *Pholiota squarrosoides*, and *P. adiposa* were found for the first time in this forest [ibid., xxiv, p. 169].

The most common cause of decay (other than canker) was *Fomes igniarius*, to which the most susceptible trees locally are beech (*Fagus grandifolia*), *A. rubrum*, and aspen (*Populus tremuloides*). *Fomes connatus* is somewhat common on *A.* spp. *Ustulina vulgaris* sometimes causes decay and extensive cankering of *A. saccharum*, beech, and, occasionally, other trees. *F. applanatus* [*Ganoderma applanatum*] is particularly common, locally, on *A. saccharum*.

Other fungi, which are less common, but may under certain circumstances cause rather extensive damage, include *Polyporus glomeratus* on *A. saccharum* and beech, *Poria obliqua* and *Stereum murrayi* [ibid., xx, p. 184] on birch, *P. prunicola* mostly on *Prunus pennsylvanicum*, *F. conchatus*, the only cause of decay so far found locally on ash (*Fraxinus nigra*), and *Dibotryon morbosum* and *Armillaria mellea* on wild cherry. Non-parasitic diseases [ibid., xxiv, p. 38] affected 46·5 per cent. of the trees, *Acer rubrum* and beech being the most frequently damaged with *A. saccharum* and wild cherry next.

RIKER (A. J.). **Some possibilities for developing resistance to disease in trees.**—*Amer. Nurserym.*, lxxxi, 12, pp. 5–7, 3 figs., 1947.

In this paper (condensed from an address to the Wisconsin Nurserymen's Association), the author mentions the more common methods used in plant disease control and discusses briefly the best general means for securing resistance. The paper concludes with a succinct review of the progress of work on the control of some of the principal tree diseases found in the eastern regions of the United States and the breeding of resistant varieties. Mention is made of a variety of red cedar, *Juniperus virginiana* var. Berg's rust resistant, now available commercially, which during five years in Wisconsin has remained almost completely resistant to *Gymnosporangium juniperi-virginianae* [*R.A.M.*, xxiv, p. 436] in the presence of rust-infested trees. Selections of white pine [*Pinus strobus*] highly resistant to blister rust [*Cronartium ribicola*: ibid., xxv, p. 586] are being propagated in Wisconsin and New York State while the resistant European currant Viking [ibid., xviii, p. 323] provides parental material for breeding work on the alternate host of this disease.

ZENTYMER (G. A.), HORSFALL (J. G.), & WALLACE (P. P.). **Dutch Elm disease and its chemotherapy.**—*Bull. Conn. agric. Exp. Sta.* 498, 70 pp., 2 figs., 9 graphs, 1 diag., 1 map, 1946.

Studies carried out since 1940 in Connecticut on Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xxiv, p. 211; xxvi, pp. 177, 365], have shown that it has not been as destructive as had been feared, but necessitates learning how to 'live with the disease'. The most satisfactory solid medium for growth and spore production of the fungus was malt extract agar [cf. ibid., xxvi, p. 320]. The zonate character of the growth on agar plates was ascertained to be a response to light and dark periods (day and night). The most effective inoculation method was to introduce a spore suspension directly into the xylem vessels by means of cuts with a sharp knife. The inoculations became progressively more rapid and effective the nearer they were made to the base of the tree. Inoculations made during active spring growth were the most effective, as regards both the percentage of trees infected and the development of the disease in the tree. Summer inoculations were somewhat ineffective and mostly failed to carry over to the next season, but were more effective during a wet summer. The probability of infection was proportional to the number of spores used in the inoculation, small dosages causing no external symptoms or only light ones and trees generally outgrew the attack in the following year. Increase in the number of inoculation points also increased the effectiveness

of any given spore dose. Effectiveness of the spores in producing the disease appeared to decrease as the spores increased in age.

Toxin production by cultures of the fungus [ibid., xxi, p. 433] was favoured when asparagine was used as a nitrogen source.

Tree condition appears of great importance in the development of the disease. Elms severely defoliated by spring cankerworms (*Alsophila pometaria* and *Paleacrita vernata*) were much more seriously affected when inoculated than were non-defoliated trees. Trees fertilized with sodium nitrate or [complete] 10–10–10 fertilizers were less severely attacked than unfertilized controls or those given urea or ammonium sulphate. The most vigorous trees, regardless of type of fertilizer, were much less affected by the disease than those showing less vigour.

Studies on the rate of involvement of the tree showed a logarithmic dimensional equivalence of distance, time, spore load, and resistance of the vessels to transmission of water. The results did not quite agree with what would be expected from hydraulic theory, which postulates arithmetic dimensional equivalence of time, distance, and pressure. It is to be presumed that the lag that introduces the logarithmic factor is an exponential rate of vascular plugging due to the formation of tyloses and gums.

Intensification of the disease in a town was arithmetic with time. Infection has spread through Connecticut arithmetically with time at an approximately constant rate of 5·4 miles per year along radii of a circle centred at Battery Park, New York City, probably the original port of entry. The slopes of the curves showing the advance of the disease within a town or across the State since 1933, when the great roguing experiment started, do not become steeper for 1940, when roguing stopped.

Of over 100 organic chemicals tested against the fungus *in vitro*, the heterocyclic 8-hydroxyquinoline group [ibid., xxvi, p. 45] and the triphenyl methane dyes were the most effective. Chemotherapy studies [ibid., xxvi, p. 84] showed that hydroquinone, *p*-nitrophenol, benzoic acid, and dithane were also effective. Protection was conferred when these chemicals were injected into trees or were watered into basins at the base before inoculation, while in therapy experiments the same chemicals and pyrogallol similarly retarded infection. This retardation could be studied graphically, in comparison with untreated trees, from curves which showed that the progress of the disease in a tree during a normal growing season bore a linear relation to the logarithm of time when the percentages of infection per tree were plotted as probits against the logarithm of the number. Some of the treatments which markedly increased the time interval between inoculation and 50 per cent. infection were injections with 8-hydroxyquinoline sulphate and benzoate, hydroquinone, *p*-nitrophenol, pyrogallol, and quinone, most of which were administered at a concentration of 1 gm. per l. Curve slope and number of days required to reach a given disease level (50 or 95 per cent.) should both be considered in estimating the efficiency of a chemical.

Pruning at a very early stage 2 or 3 ft. below the last visible discoloration in the wood invariably prevented a recurrence of infection.

Wide variation was observed in the response of seedling American elms (*Ulmus americana*) to artificial inoculation with *C. ulmi*, indicating that it should be possible to develop a resistant American elm.

POMERLEAU (R.). **The Dutch Elm disease in Canada.**—Abs. in *Proc. Canad. phytopath. Soc.*, *1946*, 14, pp. 15–16, 1 map, 1946.

During a complete survey in 1945 of the distribution of Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstract] in eastern Canada [*R.A.M.*, xxvi, p. 330] 18,000 trees were examined and samples taken from 2,227 in the Province of Quebec. Of these latter, 1,321 showed the presence of *C. ulmi*, 365 of *Dothiorella*

ulmi [ibid., xx, p. 608], 15 of *Verticillium albo-atrum* [ibid., xxii, p. 219], and 318 of miscellaneous fungi. Samples from other provinces did not yield *C. ulmi*.

This first complete survey showed that at least 24 counties are affected by the outbreak, which covers a total area of about 7,000 sq. m. The gap of over 200 miles separating the Canadian from the United States outbreak suggests that there is no direct connexion between the two centres of distribution. There is reason to believe that infected material reached the port of Sorel from Europe several years ago.

GOIDÀNICH (G.). **La 'necrosi corticale' del Pioppo causata da Chondroplea populea (Sacc. et Br.) Kleb.** [Bark necrosis of Poplar due to *Chondroplea populea* (Sacc. & Br.) Kleb.]—Reprinted from *Riv. cellulosa*, xviii, 5, 29 pp., 2 col. pl., 24 figs., 1940. [Received June, 1947.]

In this paper the author gives a comprehensive account of poplar canker due to *Chondroplea populea* [*R.A.M.*, xii, p. 790; xvii, p. 569] (for which the name *Dothichiza populea* [ibid., xxv, pp. 153, 586] has generally been preferred), based on the literature up to 1940 and on his personal observations in different parts of Italy. The points dealt with comprise the history and geographical distribution of the disease, macro- and microscopic characters, host range, injury caused, the morphological and cultural characters, biology, and systematic position of the causal organism, etiology, effect of environmental conditions and cultural practices, transmission by inoculation, and control.

The disease, first reported from France in 1903 [cf. ibid., iii, p. 244], was recorded from Piedmont in 1906, where it had been present, probably, since 1902. By 1940, it had spread to every part of Italy except for a few regions in the south. It attacks nearly every kind of poplar widely used in Italy. The disease caused up to 90 per cent. mortality in Cremona province and the Alta Valle di Nure in 1936, up to 95·5 per cent. at Belgioioso (Pavia) in 1938 [ibid., xix, p. 68], up to 70 per cent. at Collobiano in the same year, and up to 50 per cent. at Casale Monferrato among Canadian poplars in plantings containing several hundreds. One worker has reported [1939] that in a plantation of Canadian poplars at Alberi di Vigatto (Parma) incidence rose from 10 to 95 per cent. between 23rd March and 8th April.

Saccardo's description of the fungus, under the name *D. populea* (*Sylloge*, iii, p. 672), is in some respects incomplete. The fructifications are 250 to 2,000 μ in diameter and 250 to 600 μ high, and are sunk in the matrix or rise only slightly above it. They consist of a stroma of which no trace remains when the pycnidia are mature except for protuberances or column-shaped appendages which sometimes arise in the pycnidial cavity. The wall has a plectenchymatous, in places occasionally a hyphenchymatous, structure, with cells up to 25 by 4 to 6 μ. The opening is brought about by the tearing or contraction of the upper part of the wall and is sometimes so wide open that it is doubted whether the fungus can be included in the Sphaeropsidales. The conidiophores form a thick lining in the pycnidial cavity. They are simple and unicellular or, more often, branched and multicellular, straight or flexuose-recurved. The terminal part, separated from the rest by a septum, is always awl-shaped and measures 18 to 30 by 3·2 to 4 μ. The abundant conidia, produced in waxy-mucilaginous cirrhi, are unicellular, colourless, opaque, usually ovate-piriform but also spherical to ellipsoidal, 9 to 13 by 7 to 9 μ, and distinctly attenuated at the point of attachment to the conidiophore. Germination takes place in a few hours. Fruiting is abundant and can occur at any time of the year, except in periods of extreme drought, both on living and dead parts of the host.

The morphological characters of this fungus are such that it can no longer be included in *Dothichiza*. The type species is *D. sorbi*, the structure of which (as studied by Klebahn on Libert's original material) has nothing in common with the poplar

organism; in particular, the shape and origin of the conidia are different. The suggestion that it might belong to *Discula* has been criticized by Klebahn, who renamed the fungus *Chondroplea populea*.

The fungus lives very well as a saprophyte, assuming a pathogenic character when it finds a weakened or susceptible host, or when the environmental conditions are favourable to it and unfavourable to the host. For these reasons the disease commonly attacks young trees not perfectly rooted, or which, after transplanting, are in a critical stage of growth. Under such conditions the disease may assume epidemic proportions in cold years, in waterlogged soils, or where the cultural conditions are unsatisfactory. Entrance takes place either through wounded or unwounded surfaces. The disease is favoured by low temperatures but humidity is unfavourable to it except in so far as by weakening the host it renders it more susceptible. Observations in one locality showed that 95 per cent. of the trees transplanted in autumn became affected, as against only 23·5 per cent. of those transplanted in spring.

When all the infection sites can be recognized with certainty, tree surgery offers a means of direct control, especially of older trees, but in actual practice preventive methods have to be adopted. Only cuttings from healthy trees growing in a district in which the disease has never appeared should be used and these must be planted promptly, if possible on the day they are made. If they have to be sent away or stored they should be disinfected with slightly acid 2 or 3 per cent. Bordeaux mixture. Layers should receive similar treatment. The nursery should be planted on fresh, well-aerated soil on which poplars have not been grown for some years. Routine roguing and spraying should be practised. It seems likely that Chiarabba's 'direct' method of planting out in the field may reduce the danger of epidemics during this critical period. Holes are made in early autumn, duly spaced, and filled in with the same soil mixed with fertilizer. About the middle of February, three cuttings, or unpruned, one-year saplings, are planted in each hole 5 cm. apart. When the shoots are 30 to 40 cm. tall, only one is left in each hole, the others being cut down level with the soil surface.

Plantations aged one to two years should be inspected carefully and rogued ruthlessly. In areas where the disease is present, the trees should be sprayed in winter with iron sulphate or Bordeaux mixture. If removal is not desirable in order not to spoil the regular arrangement of the plantation, the stem can be cut a little above soil-level and one of the shoots raised instead, the cut being disinfected. In all cases, strict hygiene is necessary. Preventive measures include the use of naturally resistant varieties and those developed by breeding and selection. These methods, carried out with care and promptitude, give every hope of successful control.

BIER (J. E.) & BUCKLAND (D. C.). **Relation of research in forest pathology to the management of second growth trees. I. Poria weirii root rot, an important disease affecting immature stands of Douglas Fir.**—Reprinted from *B.C. Lumberm.*, [5 pp., folder], 5 figs., 2 maps, 1947.

Root rot of Douglas fir (*Pseudotsuga taxifolia*) trees caused by a form of *Poria weirii* [*R.A.M.*, xx, p. 97; xxi, pp. 508, 544; xxvi, p. 272] is general on Vancouver Island, along the mainland coast, and in the lower Fraser Valley; it has been found as far north as the islands in Johnstone Strait, as far east as Yale in the Fraser Valley, and in the interior at Revelstoke. Apparently, it is present throughout the northern range of Douglas fir. Other susceptible trees found in addition to those previously noted were Amabilis fir (*Abies amabilis*), Sitka spruce (*Picea sitchensis*), and western yellow pine (*Pinus ponderosa*).

Three ¼-acre areas of 35- to 40-year-old Douglas firs were marked out at Cowichan Lake in 1939 so that the spread of the disease from established infection centres

could be followed. In 1945, on the plot where the least fungal activity occurred, 21 per cent. of the expected increment of the dominant and co-dominant trees had been destroyed by the disease. Investigation of three sample plots of 60-year-old stands of Douglas fir near Yale in 1942 showed that decrease in the number of trees between 1935 and 1941 due to *P. weirii* root rot was, respectively, 38, 32, and 51 per cent., the corresponding figures for decrease in basal area being 0·8, 7·3, and 23 per cent. In a 44-year-old stand of Douglas fir, the first observation of the root rot was made in 1935, when two trees were killed by the fungus. In 1945, of the original 49 trees only 27 remained, 20 of the dead trees having been killed by root rot. Of the 35 original trees classified as dominant and co-dominant, 14 were killed by the disease. In 1935 the volume of the stand was 1,048 cu. ft.; in 1945 the expected volume was computed to be 1,430 cu. ft., but was actually only 919. Of the 511 cu. ft. lost, 504 cu. ft., or 134 per cent. of the expected increment, was lost through root rot.

As a rule trees are killed in groups, which results in stand openings that gradually increase in size. A 'distress' crop of cones, which are smaller than usual, is generally an indication of root infection. An infected tree may show these signs, accompanied by a gradual thinning of the foliage, for a year or two before the tree dies.

It is concluded that careful examinations should be made for the presence of this disease in all immature stands that are to be placed under management. Unless depletion from this cause is provided for as part of the management policy, grossly inaccurate figures may be obtained for all estimates of future growth and yield.

Bier (J. E.), Foster (R. E.), & Salisbury (P. J.). **Studies in forest pathology. IV. Decay of Sitka Spruce on the Queen Charlotte Islands.**—*Tech. Bull. Dep. Agric. Can.* 783, 35 pp., 10 pl., 1 diag., 2 graphs, 1 map, 1946.

This is an expanded version of the information already presented concerning the decay of over-mature Sitka spruce (*Picea sitchensis*) on the Queen Charlotte Islands, British Columbia [*R.A.M.*, xxvi, pp. 87, 223].

Peklo (J.). **K etiologii vývratů v jihočeských lesích Borových.** [On the etiology of wind damage in South Bohemian Pine woods.]—*Lesn. Práce*, xx, pp. 370–391, 2 pl., 6 figs., 1941. [German summary. Received May, 1947.]

In 1939 enormous losses were caused by wind damage in Czechoslovakian woods. Examinations made in the neighbourhood of Chlum near Třeboň in 1940 showed that numerous damaged pines [unspecified] had rotten roots and a strong smell of turpentine. The wood rot was identical with that caused by *Polyporus schweinitzii* [*R.A.M.*, xxiii, pp. 199, 321] found in the same locality, and it is presumed that in most cases the rot was caused by this fungus. In two samples of the rotten roots the author found *Trametes* [*Fomes*] *pini* [ibid., xxii, p. 413] and was able to prove its destructive activity microchemically and culturally. It is possible that *F. pini* was also responsible for windfalls.

Peklo (J.). **Příspěvky k biologii hub dřevomorných: z genetiky choroše Poria undata Bres.** [A contribution to the biology of some wood-destroying fungi: on the genetics of *Poria undata* Bres.]—*Lesn. Práce*, xxiii, pp. 290–326, 13 figs., 1944. [English summary.]

A. Pilát described in 1933 an unusual expansive growth of *Poria undata* [*R.A.M.*, xii, p. 410] in the railway-tunnel of Vinohrady in Prague. The author and his assistant investigated from 1934 to 1937 the ability of this fungus to attack railway sleepers. Isolations were made from oak sleepers and the tunnel wall. Pure cultures from single basidiospores showed that there were many strains, representing two

categories. One group formed more or less smooth, soft, raised, slimy, yellowish-white colonies. The mycelium was composed of coarse fibres easily budding into yeast-like elements, until finally the whole colony consisted of large, isolated, elongated or round cells. In some cases these continued to bud in a yeast-like manner. The other group formed compact, white or yellow to brown felt-like masses. They formed rhizomorphs, mostly of a complicated structure.

The yeast-like biotypes did not attack the wood of conifers or oak. The felt-like biotypes vigorously attacked unimpregnated beech, spruce, and to a lesser degree pine and larch wood. When beech wood was kept moist with 0·25 per cent. sodium carbonate there was no infection, but when disodium or diammonium phosphate (0·25 per cent.) was used profuse growth of the fungus was noticed, which was much greater than when water alone was used. Impregnated beech wood was hardly attacked, even when phosphates were added. Oak wood showed the greatest resistance to *P. undata*, although unimpregnated oak sapwood was vigorously attacked. The fungus attacks oak wood under conditions of great humidity and in the presence of certain minerals, especially phosphoric acid and ammonia.

The great variability displayed by the numerous biotypes requires some adjustment in the international method of testing wood fungicides. The inoculum should be obtained by sowing basidiospores and not merely by means of isolations from the mycelial tissue.

From numerous further monobasidiospore isolations more varied biotypes were obtained. The cultures of these varied from a soft, felt surface growth, to one with an entirely smooth surface, quite hard and cartilaginous. Anatomical examination showed that both types belong to *P. undata*. Small, rudimentary, sterile fruiting bodies were obtained in culture for the first time. By pairing different isolations together fruiting bodies were formed which might produce basidiospores.

DERMOTT (W.) & TRINDER (N.). **Brown heart in Swedes: a Cumbrian survey.**—*J. agric. Sci.*, xxxvii, 2, pp. 152–155, 1947.

Brown heart of swedes due to boron deficiency [*R.A.M.*, xxv, p. 244; xxvi, p. 90] seems to have become increasingly prevalent in recent years in Cumberland and is probably more common in that county and Westmorland than in any other part of the British Isles. A survey of the Cumberland swede fields in 1944 showed that 53 fields were affected, as against 42 unaffected, approximately half the recorded cases being severe. In general, the boron content of the deficient fields was under 0·3 parts per million, as against a mean of 0·38 for the fields with healthy crops, though some of the latter showed an available boron content of 0·3 parts per million or less. Most cases occurred on light soils, 61 per cent. of the affected fields and only 24 per cent. of the unaffected having soil lighter than medium in texture. Of all the affected fields, 52 per cent. had been limed since 1939, while of the healthy ones only 30 per cent. had been limed since that year. As little difference was found between the mean pH values of the affected and unaffected areas it would appear that recent liming is more important in inducing the condition than the actual pH value of the limed soil.

It seems that a prediction that swede brown heart may occur in a given field may be made from a knowledge of the available boron content of the soil, the soil texture, and liming history of the field.

PENDLETON (R. A.), FINNELL (H. E.), & REIMER (F. C.). **Sugar Beet seed production in Oregon.**—*Bull. Ore. agric. Exp. Sta.* 437, 23 pp., 7 figs., 1 graph, 1946.

So far plant diseases have not affected the sugar beet seed crop in western Oregon very seriously. *Ramularia beticola* [*R.A.M.*, xxi, p. 237] is prevalent in winter and early spring. *Cercospora beticola* [ibid., xxv, p. 324] occurs in warmer weather, but is less abundant. Some progress is being made in breeding for resistance to these

two diseases. A seed-stalk blight caused by *Phoma betae* [ibid., xxiv, p. 269] is responsible for considerable damage in some seasons. Sugar beet varieties resistant to *C. beticola* [ibid., xxvi, p. 39] also show resistance to both *R. beticola* and stalk blight. These diseases are not sufficiently serious to necessitate control measures, although in some areas some leaf-spot control is secured by spraying or dusting with copper fungicides. New plantings of sugar beets in fields directly adjacent to recently harvested seed fields have shown increased disease in the areas nearest to the old fields. Downy mildew (*Peronospora schachtii*) [ibid., xxiv, p. 173] occasionally causes considerable damage which may be severe in late autumn-planted beets. Black streak (? *Pseudomonas aptata*) [loc. cit.] is common in western Oregon but it has caused little damage except at Klamath Falls, where a high percentage of infection occurred in a few fields. Beet rust (*Uromyces betae*) [ibid., xxii, p. 284] is abundant in the Willamette Valley at times. Seedling diseases are unimportant and readily controlled by seed treatment. The local seed company customarily treats all seed with fungicidal dust.

Bjornseth (E. H.). **One year's results from dusting snap Beans to control anthracnose and leaf hoppers.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 3, pp. 191–193, 1946.

There have been several outbreaks of bean anthracnose [*Colletotrichum lindemuthianum*: *R.A.M.*, xxv, p. 199] in Michigan during recent years. In 1945 seed-dusting trials were made in areas where snap beans [*Phaseolus vulgaris*] were a major crop and where anthracnose and leafhoppers were usually common. After dusting with two applications of 3 per cent. DDT, followed by two of 3 per cent. DDT plus 10 per cent. fermate, three pickings were made, yielding a total of 223·45 bushels per acre as against 156·8 from non-dusted plots. As anthracnose was absent that year the fungicidal value of the fermate could not be determined, but its use in the late summer when anthracnose might develop would probably be justified. The cost of the dusting materials for 1945 worked out at $15 per acre.

Goidànich (G.) & Camici (Leontina). **Un parassita microscleroziale, del tipo Sclerotium (Rhizoctonia) bataticola Taub., presente in Italia.** [A microsclerotial parasite resembling *Sclerotium* (*Rhizoctonia*) *bataticola* Taub. present in Italy.] —Reprinted from *Ric. sci. Ricostruz., Roma*, xvi, 11, 6 pp., 2 figs., 1946.

During 1946 a fungus resembling *Sclerotium bataticola* [*R.A.M.*, xvii, p. 115], the vegetative stage of *Macrophomina phaseoli* (not previously recorded in Italy) [but see ibid., xviii, p. 517], in its morphological characters and the nature of the infection it caused, was found on broad beans in Sardinia and French beans [*Phaseolus vulgaris*] at Loana, on the Riviera. In the first case the plants had dried up in either scattered or confluent patches in the plot, and in the second they had died off as a result of a progressive wilt. The first crop was being grown in rotation with cereals while the other had been preceded by chick peas [*Cicer arietinum*], which had failed.

In culture the fungus rapidly formed round colonies at first hyaline and finally an intense carbonaceous black with little, if any, aerial mycelium. Microsclerotia developed in profusion, measuring 90 to 120 μ in diameter in the strain from French bean and 105 to 150 μ in that from broad bean. The hyaline, septate hyphae, 2·5 to 3 μ in diameter, had numerous anastomoses; in proximity to the sclerotia they measured up to 7 μ in diameter.

On French beans the symptoms consisted of a diffused chlorosis of all the aerial parts, this being followed by sudden withering. The plants remained stunted and even the roots were dwarfed. In the final stage the surface of the stem from the first to the third internode and even of the underground part turned a light, almost gleaming, ash colour. The cortical tissues flaked off, leaving the woody cylinder

bare. Microsclerotia were present in all the affected parts, particularly in the medullary canal in the area of the collar. Reddish-brown, globose or depressed-globose, empty fruiting bodies were also found, with or without a short neck and showing a distinct ostiole; they measured 135 to 180 by 120 to 155 μ. Definite identification of the fungus is awaited.

M. phaseoli has been reported in the Mediterranean basin from Egypt, Syria, Palestine, Cyprus, and Tunisia, and also from Rumania; in 1938, a fungus thought to be *M. phaseoli* was found in Sicily, but the culture was mislaid during the war. If the fungus described in the present paper turns out in fact to be *M. phaseoli*, Italian agriculture will have to take note that it faces a very serious enemy, which is probably already widespread in the country.

LAVALLÉE (E.). **Les méfaits du mildiou sur les Oignons porte-graines en 1943.** [The damage caused by mildew to seed Onions in 1943.]—*Rep. Quebec Soc. Prot. Pl., 1943–1944*, pp. 25–28, 8 figs., [? 1947].

In 1942 and 1943 seed onions growing in the vicinity of Montreal were severely attacked by mildew (*Peronospora destructor*) [*R.A.M.*, xxiii, pp. 5, 474]. In the latter year the author found six fields in this locality completely ruined by the disease, though four nearby remained unaffected. Seed onions show the same leaf symptoms as onions grown for the bulbs, and like them develop secondary infection of black mould due to a species of '*Macrosporium*'. Spraying tests using Yarwood's formula (1 per cent. rosin with 2 per cent. commercial lime-sulphur in water) [ibid., xvii, p. 122] were carried out. The spray fluid adhered well. In one area spraying was begun on 14th July, when 50 to 60 per cent. of the stalks were slightly affected, but part of the field showed scarcely any infection. After one week, during which no rain fell, a second application was made. The third week was very wet, and the disease became as severe on the sprayed as on the unsprayed plants; almost all the stalks were affected and 75 to 80 per cent. of the crop was lost. The disease appears to be the chief handicap to the production of seed onions in Quebec.

NELSON (R.). **Dust fungicides versus formaldehyde in the control of Onion smut.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 3, pp. 226–247, 4 figs., 1946.

This account deals with experiments in controlling onion smut (*Urocystis cepulae*) [*R.A.M.*, xxv, p. 57] during 1943 and 1945 on commercial farms in the Gun Swamp area, Michigan, where the soils are heavily infested with the fungus. Arasan and fermate were used as seed dusts. Formaldehyde was applied as a 1 per cent. solution at 15 c.c. per ft. of row with the seed [ibid., xxiv, p. 305], which is the standard method for growers. In 1943 the dusts gave apparently better control (3 to 3·7 per cent. smut, 51 to 59 per cent. stand, 3 kg. yield) than the formaldehyde (11·8, 46·5, and 2·3). Formaldehyde gave very good smut control (2·3 and 4·2 per cent. smut; 13·5 kg. yield) in 1945, arasan being far inferior (7·6 and 6·7; 10·28). The inconclusive evidence from these experiments shows that dusts are neither superior nor equal to the standard formaldehyde method of controlling *U. cepulae* in soils with moderate to heavy infection. In light infections dusts have given adequate control. In small-scale trials arasan (1 lb. with 4 lb. seed) gave satisfactory control in heavy seedings for set production. Dusts should not be used on a large scale by farmers until more conclusive results have been obtained.

BOWSER (P. H.). **Effects of DDT on cabbage maggot of Radish and on aster yellows and the leafhopper of head Lettuce: a progress report.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 3, pp. 194–200, 1946.

It was found that yields of marketable heads of Great Lakes and Imperial 456 lettuce from DDT-treated plots were greater than those from untreated, although these were quite high in spite of a higher infection with aster yellows virus. Four

successive crops in 1945 were treated with DDT as a protection against leafhoppers carrying aster yellows virus [*R.A.M.*, xxiv, p. 128], and in each case the greatest yields were obtained when a 25 per cent. DDT dust was used, although a 5 per cent. dust also gave good control. The number of disease-free lettuce heads declined from 88 per cent. in the first crop to 66 per cent. in the third, showing that as the summer progresses leafhopper damage, and hence percentage of yellows, increases up to the time of the September harvest. Imperial 456 was less susceptible than Great Lakes.

TOWNSEND (G. R.). **Celery mosaic in the Everglades.**—*Plant Dis. Reptr*, xxxi, 3, pp. 118–119, 1947. [Mimeographed.]

Since 1932 the incidence of celery southern mosaic [strain of cucumber mosaic virus: *R.A.M.*, xxvi, p. 148] on the muck lands of Palm Beach County, Florida, has increased, and other types characterized by a milder chlorosis and thin, downward rolling leaves, and a filiform leaf type have appeared [ibid., xviii, p. 369]. Heavy losses were recorded in 1938, and a loss of 80 per cent. of the crop was sustained in 1939. The chief weed host in this case was *Commelina longicaulis*. Newly cleared muck lands were free from both this weed and the mosaic. The weed propagates very easily and is an excellent reservoir for the virus, which is transmitted by aphids. On one farm the crop was so seriously damaged between 1938 and 1943 that a programme for eradicating the weeds was put into force and later intensified by the addition of 2,4–D sprays in the last two years. This year less than 1 per cent. of a 200-acre celery crop was lost through mosaic compared with 100 per cent. infection and heavy losses sustained on weedy farms nearby.

SARASOLA (A. A.). **Una enfermedad poco común de nuestros Cucurbitaceas cultivadas.** [An uncommon disease of our cultivated Cucurbitaceae.]—*Publ. tec. Dir. Agric., B. Aires*, ii, 6, pp. 1–9, 3 figs., 1944. [Received May, 1947.]

This is an account of the downy mildew of Cucurbitaceae (*Pseudoperonospora cubensis*), comprising observations on its symptomatology, the morphology of the causal organism and the germination of its conidia, the propagation of the pathogen, and control measures. The first record of the disease in Argentina by Renaco dates from 1916 (*An. Soc. cient. Argent.*, lxxxi, p. 64), and it was again encountered in 1941 on cucumbers, watermelons, and (?) vegetable marrows ('zapallo').

ATKINS (F. C.) & LA TOUCHE (C. J.). **Disease caused by Verticillium malthousei Ware (brown spot, fungus spot, dry bubble).**—Mushroom Diseases Leaflet I, Yaxley, Peterborough, published by the authors, 2 pp., 3 figs., 1947. 1*s*.

Brief notes in summarized form are given on the mushroom [*Psalliota* sp.] disease cause by *Verticillium malthousei* [*R.A.M.*, xiii, p. 286; xxvi, p. 4], including characteristics, source of infection, prevention, control, and a scientific description of the causal organism.

VIENNOT-BOURGIN (G.). **La culture du Champignon de couche. (Suite.) VIII. Dactylium dendroides parasite du Champignon de couche.** [The cultivation of the edible Mushroom. (Continuation.) VIII. *Dactylium dendroides*, a parasite of the edible Mushroom.]—*Rev. Mycologie*, N.S., xi, 1, *Suppl.*, pp. 4–6, 1 fig., 1946.

Cultivated mushroom (*Psalliota*) beds at Poligny (Jura), when they have been in production for a month or more, have for some years past become infected by *Dactylium dendroides* [*R.A.M.*, xviii, p. 779; xxii, p. 160]. Very diffuse at first, the hyphae soon form isolated patches 10 to 30 cm. in diameter, consisting of a felty layer 10 to 20 mm. thick on the surface of the beds. Tufts of conidiophores develop later. Mushroom production becomes greatly reduced or is arrested in the affected patches. If a few buttons appear on the infected sites they reach a height of

only 12 to 24 mm. and do not spread open. As the parasite develops, the stipe and the incurved edge of the pileus show a cobwebby mycelium consisting of loose tufts or small light bluish-grey parallel bundles connecting tangentially the pileus to the base. While most of the mushrooms, on emergence, bear very few traces of soil, the infected ones are recognizable not only by their reddish-grey, later brownish colour, but by the numerous grains of sand caught in the mycelial threads and accumulated on the surface. The infected sporophores rapidly mummify and turn brown. If a mushroom covered with a large amount of mycelium is cut longitudinally, the outermost part of the stalk and pileus is markedly blackish-brown along a regular band 1 to 2 mm. wide sharply delimited from the deep part of the sporophore. This part turns a light buff colour, except for the central part, which does not change. The base of the stalk becomes leathery and markedly necrosed.

Good control is given by using a paste consisting of bleaching powder and lime. Further tests are to be made with other materials containing chlorine.

Reitsma (J.) & Slooff (W. C.). **A disease of Eggplant fruits caused by Phytophthora parasitica Dastur and Phytophthora palmivora Butler.**—*Chron. Natur.*, ciii, 5, pp. 60–63, 3 figs., 1947.

The organisms isolated on standard media from rotten eggplant fruits near Buitenzorg, Java, in April, 1943, were identified as *Phytophthora parasitica* and *P. palmivora* [*R.A.M.*, x, p. 754]. On a common purple variety with oblong fruits the roughly circular, brown, water-soaked lesions, 0·5 cm. in diameter, rapidly expand lengthways, forming elongated patches. On roundish fruits of Black Beauty, on the other hand, the darker-coloured spots spread at a uniform rate in all directions, retaining their circular appearance. The underlying tissue is discoloured, sodden, and separated from the sound portion by an irregular brownish margin.

Wounded and intact fruits were inoculated with both fungi with positive results. The typical differences in the mode of development of the two species were clearly perceptible after 48 hours, *P. palmivora* producing small clumps of aerial mycelium scattered over the centre of the lesion, while the copious growth of *P. parasitica* covered almost the whole of the infected area.

Control measures should include spacing the plants 1 m. apart, soil hygiene, prompt removal of diseased fruits, and fortnightly applications of 1·5 per cent. Bordeaux mixture.

Avni (Y.). **Encore le 'court-noué'.** [Court-noué again.]—*Rev. Vitic., Paris*, xciii, 1, p. 6, 1947.

The author cites a case of vine court-noué [*R.A.M.*, xxvi, p. 226] observed by him in Palestine in January, 1938. A five-year-old vineyard suddenly developed a general wilting; no causal organism was found, but the symptoms agreed with those described for the disease, and the author's diagnosis was confirmed by experts. Of 1,200 ha. about 200 were affected, and most of the vines came from French nurseries. All the local nurseries were also found to be affected. After consideration of all the factors, permission was given to plant the vines from the affected nurseries in different parts of Palestine, and at the same time numerous healthy and court-noué plants were planted side by side. Dead vines were replaced by healthy ones without disinfecting the soil.

Dry conditions prevailed in 1938 and a few vines dried up. During pruning in 1939 some vines were found to be dead, or partly so. In the original nursery the remaining vines developed well and all signs of court-noué disappeared. Healthy vines next to diseased ones remained vigorous, and those affected with court-noué appeared to recover and have since remained normal. The vines planted where dead ones had been, grew well. Vineyards planted with vines from affected nurseries have remained in excellent condition.

The evidence adduced in the paper is considered to indicate that court-noué is not a parasitic, incurable disease.

NYSTERAKIS (F.). **'Court-noué' et Phylloxera vitifoliae Fitch.** [Court-noué and *Phylloxera vitifoliae* Fitch.]—*Rev. Vitic., Paris*, xciii, 1, pp. 9–12, 1947.

After discussing the view that the virus causing contagious court-noué of the vine [see preceding abstract] (if the disease is, in fact, due to a virus) may, perhaps, be carried by *Phylloxera vitifoliae* [cf. *R.A.M.*, xix, p. 67; xxvi, p. 227], the author describes an experiment started in 1940 to ascertain whether these insects after feeding on the juice of affected vines are able to cause identical stunting of healthy vines. A thick layer of fine sand covered with 15 cm. of a soil very favourable to *P. vitifoliae* was put into pots. Healthy Aramon vine roots were planted in the soil, which was then covered with sand. At the end of spring and again at mid-summer, leaves bearing *Phylloxera* galls from Rupestris du Lot stocks which had been affected with court-noué for many years were inserted and ten days later removed. During this period the plants were not watered.

The ensuing winter the roots of all the plants except one showed numerous swellings due to the insect. Later they were transferred to pots of healthy, disinfected soil. At planting-out most of the roots were removed and the entire plants thoroughly cleansed to remove any insects that might remain. At the time of writing, six years later, these plants show no stunting.

Petri in 1918 and Ravaz in 1928 both claimed transmission of the disease to healthy vines in the first or second year after their being contaminated by the soil or the roots of affected plants. The author has observed the symptoms of court-noué to develop in the same period, when the former method was used, but in these instances the affected vines showed no swellings.

It is considered that these facts demonstrate that *P. vitifoliae* is not a natural vector of the causal organism of contagious court-noué of the vine.

The author also draws attention to the fact that in many cases the general development of the disease is the same whether the insect is present or not in a vineyard. The literature shows that the disease was present in Europe long before the insect was introduced. But even if it can be proved that there was a recrudescence of the disease after the introduction of the insect, the fact remains that before this the causal agent must have been present in some organism other than the insect to account for the fact that new plantations and vines surrounding diseased ones became affected. The author has found the disease in Crete, where the insect is not present [ibid., xix, p. 454].

BLATTNÝ (C.), NOVÁK (S.), VIELWERTH (V.), KAC (A.), STARÝ (B.), & RYŽKOV (N.). **Zpráva o škodlivých činitelích kulturních rostlin ve vegetačním roce 1940–41 v Čechách.** [Report on harmful factors affecting crops in Bohemia during the season 1940–41.]—*Ochr. Rost.*, xviii pp. 5–16, 1942. [Abbreviated German translation. Received January, 1947.]

Brief notes are given on diseases most prevalent in Bohemia, Czechoslovakia, during 1940–1: *Leptosphaeria herpotrichoides* [*R.A.M.*, xix, p. 337] occurred on rye, particularly when following clover and barley, and *Ophiobolus herpotrichus* caused considerable damage to early wheat where sown after barley and wheat.

ROZSYPAL (J.). **Zpráva o škodlivých činitelích kulturních plodin ve vegetačním období 1940–41 na Moravě.** [Report on harmful factors affecting crops in Moravia during the season 1940–41.]—*Ochr. Rost.*, xviii, pp. 17–24, 1942. [German summary. Received January, 1947.]

In Moravia, Czechoslovakia, in 1940–1 [*R.A.M.*, xvii, p. 500 and preceding abstract] stem-breaking of wheat caused by *Ophiobolus herpotrichus* was of epidemic

proportions. *Phoma betae, Pythium* sp., and *Corticium solani* caused considerable damage to beet, up to 20 per cent. in certain fields. Sugar beet was also attacked by *Bacterium tumefaciens* and to a lesser degree by *Cercospora beticola.*

DEY (P. K.). **Plant pathology.**—*Adm. Rep. agric. Dep. U.P., 1944–1945*, pp. 38–40, 1947.

During the period under review, all-India co-operative experiments demonstrated that seed treatments against jowar [sorghum] grain smut [*Sphacelotheca sorghi*: *R.A.M.*, xx, p. 289; xxiii, pp. 293, 294] with agrosan G, copper carbonate, Baluchistan sulphur, and fungus sulphur resulted in no significant differences in percentage infection, though all reduced it in comparison with the untreated controls. The incidence of arhar [pigeon pea] wilt [*Fusarium udum*: ibid., xxvi, p. 144] was reduced from 64 to 38 per cent. in a susceptible variety when it was grown mixed with sorghum. That potato ring disease [*Xanthomonas solanacearum*] can be successfully controlled by growing a thick crop of soy-bean the season before was again demonstrated at four places in the Naini Tal District.

On p. 20 of this report it is stated that the results of tests at Shahjahanpur showed that Co. S302, Co. S222, and Co. S163 sugar-cane varieties were the least susceptible to red rot [*Physalospora tucumanensis*: ibid., xxvi, p. 214].

On p. 25 it is stated that irrigation in the last week of February markedly increased rust (*Puccinia graminis* and *P. glumarum*) incidence on C. 13 wheat, the grain yield being reduced by about 13 per cent. A plot given only two well-timed irrigations showed 5 per cent. *P. graminis* and about 10 per cent. *P. glumarum*, and gave a grain yield of 21·5 maunds per acre, whereas an adjacent plot, given the additional late irrigation, showed about 20 and 40 per cent. infection by the two diseases, respectively, with a grain yield of only 19 maunds per acre.

EASTHAM (J. W.). **Report of Plant Pathologist.**—*Rep. B.C. Dep. Agric., 1946*, pp. W92–W100, 1947.

In this report [cf. *R.A.M.*, xxvi, p. 187] it is stated that plum black knot (*Dibotryon morbosum*) [ibid., xxiv, p. 375] seems to be increasing in the Lower Fraser Valley, British Columbia, and must now be regarded as a disease of major importance. Plum pocket or bladder plum (*Taphrina pruni*) [ibid., xvii, pp. 468, 609; xx, p. 123] also appears to be occurring more frequently, though reported only from the vicinity of Vancouver.

W. R. FOSTER states that the most important diseases in British Columbia in 1946 appeared to be little cherry [ibid., xxvi, p. 204], strawberry red core [*Phytophthora fragariae*: ibid., xxvi, p. 9] bunt (*Tilletia caries* and *T. foetida*) of winter wheat, potato late blight [*Phytophthora infestans*: ibid., xxii, p. 9], and *Verticillium* wilt of tomatoes (*V. albo-atrum*) [cf. ibid., xxiv, p. 169]. Little cherry is now one of the most important problems confronting the fruit industry of British Columbia. It has spread to almost every fruit-growing area of the Kootenays, and during 1946 was noted for the first time in Kaslo, New Denver, and Renata. Every tree appears to be affected in the districts of Nelson, Willow Point, Harrop, Proctor, Balfour, Queen's Bay, and Taghum. In a tree-to-tree survey of 24 orchards in the Creston district in July the number of affected trees ranged from 0 to 92 per cent. In this locality the disease is widely distributed and well established. The 'Canyon' district, across the Goat River from Creston, still appears to be unaffected. For some years past, spread has been too rapid for control by the regular removal of affected trees. Growers in the Kootenays are advised against making new plantings of cherries.

The most serious handicap to strawberry growers is red core, the loss in 1946 being estimated at 20 per cent. of the berries and 10 per cent. plants killed in the Fraser Valley. Efforts are being made to develop a suitable resistant variety.

Improvement in the drainage by ridging appears to mitigate the severity of the disease.

The Ridit and Hassar winter wheat varieties have now become susceptible to bunt in the Northern Okanagan, after being resistant for nearly 15 years. By far the most suitable method of control in this area is to use Wasatch, a new resistant winter wheat variety, though it will probably have to be replaced later on. Oro wheat is resistant to all races of *T. caries* but susceptible to one of *T. foetida*. Ridit is resistant to all races of *T. foetida* but susceptible to one race of *T. caries*. Experiments in the Northern Okanagan have proved that the percentage of bunt from soil-borne infection is very high from 15th September until the end of October. Early planting is therefore advised in addition to seed treatment and the use of a resistant variety.

V. albo-atrum was widespread on tomatoes in the Lillooet district, and in a number of fields nearly all the plants were attacked. Loss was estimated at about 35 per cent. on the whole. Foliage shedding induced by the disease exposed many of the fruits to sun scald. The control methods recommended include the use of clean seed (and seed dusting), raising the young plants under sanitary conditions, and six-year rotation. Incidence is closely related to soil and air temperatures; when low temperatures prevail, sudden wilting and premature death occur; when the temperature is moderately high, as it probably was at Lillooet, there is little foliage wilting, but the leaves develop yellow patches and slowly dry from the base of the plants upwards. At high temperature the attack slowly abates. Any cultural practice which increases temperature should reduce losses.

A directive sent to potato wholesalers in the State and which came into effect on 22nd April, 1946, states that any carload of potatoes found on inspection to have bacterial ring rot [*Corynebacterium sepedonicum*: ibid., xxvi, p. 187] will have to be returned to the country of origin.

ANDRE (F.), BARSS (H. P.), & RAND (F. V.). **Experiment Station progress in insect and plant disease control, 1945.**—Reprinted from Report on the Agricultural Experiment Stations, 1945, 32 pp., 1946.

In the section of this report dealing with plant disease control (pp. 14–32) the authors present a valuable survey of the chief results obtained in 1945 in the different experiment stations throughout the United States. One section gives some striking examples of research results on disease control, while others deal, respectively, with the control of diseases of vegetables, grain, field and forage crops, and fruit. Much of the information has already been noticed in this review [cf. *R.A.M.*, xxv, pp. 181, 267, 330, 591, *et passim*], but a few examples may be cited. In three years' work in Indiana wettable sulphur proved the most effective treatment against potato scab [*Actinomyces scabies*: ibid., xxvi, p. 288]. In Ohio, fermate continued to surpass copper fungicides against tomato anthracnose [*Colletotrichum phomoides*: ibid., xxvi, p. 360]; alone 2 per cent. fermate caused only minor injury, but combined with copper-containing materials injury resulted; excellent control of both anthracnose and *Alternaria* blight [*A. solani*] was given, however, by using fermate and a fixed copper in alternating sprays. The best protection, with the highest fruit and foliage quality, was given by fermate combined with puratized N5D. In Hawaii, fermate was effective against both *A. solani* and *Stemphylium* [*solani*: ibid., xxv, p. 143].

Dithane has continued to show great promise. In Ohio in 1943 it was found effective against *Alternaria* blight [*A. solani*] of potato and tomato [ibid., xxv, pp. 331, 415], and controlled celery blight [*Septoria apii-graveolentis* and *S. apii*] about as well as copper sprays, though it gave mediocre results against tomato anthracnose, and poorer results than Bordeaux mixture against *Cercospora* and *Macrosporium* blights of carrot [*C. carotae* and *A. dauci*, respectively: ibid., xxvi, p. 409].

A spotting of wrapped tomatoes in cold storage in West Virginia was caused by *Pullularia pullulans*, not before recorded on tomato. In Oregon, a species of *Cercosporella* spread from wild turnips to the leaves of cabbages grown for seed. In 1943 and 1944 maize in Delaware showed a condition of undetermined origin in which the foliage became a brilliant red turning a purplish red over the whole plant, which produced no mature kernels, though ears might be formed; in one planting 37 per cent. of the plants were affected.

A lethal virus disease apparently new to science was reported from Oklahoma, where it caused about 75 per cent. loss in an experimental field of guar (*Cyamopsis psoraloides*).

PADY (S. M.), JOHNSTON (C. O.), & HANSING (E. D.). **Kansas mycological notes: 1945.**—*Trans. Kans. Acad. Sci.*, xlix, 2, pp. 175–183, 1 fig., 1946.

Brief notes are given on new and interesting fungi found in Kansas in 1945 and on the local distribution and damage caused by some of the economically important plant pathogens [cf. *R.A.M.*, xviii, p. 374; xxii, p. 382].

KULESCHA (Z.). **Comparaison entre la structure des néoformations provoquées par l'action de l'acide indole-acétique et du Phytomonas tumefaciens sur des fragments de parenchyma vasculaire de Topinambour cultivés in vitro.** [Comparison between the structure of the neoplasms induced by the action of indole-acetic acid and *Phytomonas tumefaciens* on the fragments of vascular parenchyma of Jerusalem Artichoke cultivated *in vitro*.]—*C.R. Soc. Biol., Paris*, cxli, 7–8, pp. 358–360, 2 diags., 1947.

A study of the comparative anatomy of the tumours in fragments of the vascular parenchyma of Jerusalem artichoke [*Helianthus tuberosus*] resulting from inoculation with *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xxvi, p. 289] and those induced by treatment with indole-acetic acid [see next abstract] revealed considerable structural differences. Both types of neoplasm contained cribrovascular bundles, which in the bacterial tumours, however, were disposed at random, contrasting with their regular arrangement in layers in the callus formations induced by the growth substance. These observations corroborate the opinion already formed, on the basis of previous studies, that the indole-acetic acid secreted by the pathogen is not the only factor involved in the development of tumours.

GAUTHERET (R.). **Action de l'acide indole-acétique sur le développement des tissus normaux et des tissus de crown-gall de Topinambour cultivés in vitro.** [Action of indole-acetic acid on the development of normal and crown-gall tissues of Jerusalem Artichoke cultivated *in vitro*.]—*C.R. Acad. Sci., Paris*, ccxxiii, 24, pp. 1728–1730, 1 graph, 1947.

Jerusalem artichoke [*Helianthus tuberosus*] stem tissues inoculated with crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) proliferated abundantly in a nutrient medium containing no indole-acetic acid, whereas normal tissues from the same source failed to grow in the absence of the heteroauxin [see preceding abstract].

ROPP (R. S.). **The growth-promoting and tumefacient factors of bacteria-free crown-gall tumor tissue.**—*Amer. J. Bot.*, xxxiv, 5, pp. 248–261, 29 figs., 1947.

The effect of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xxvi, p. 335] on tomato, tobacco, and sunflower plants inoculated with the bacterium was to induce epinasty, suppression of lateral buds, and production of adventitious roots. Cultures *in vitro* of sunflower stem segments showed that at a distance of more than one internode from the tumour roots were produced, the root-stimulating influence evidently diffusing a considerable distance through the plant. Experiments with tumour-bearing stems of *Vinca rosea* which had been freed from their bacteria by

heat treatment indicated that the root-stimulating effect came from the tumour tissue rather than from the bacteria.

Evidence was obtained which indicated that bacteria-free crown-gall tissue generates a diffusible substance capable of stimulating growth in normal callus tissue but not causing any permanent change in the tissue. *In vitro* grafts showed that tumour tissue is capable of bringing about a proliferation in normal tissue to which it is grafted. In sunflower it took the form of well-organized spherical outgrowths with a woody core and differentiated cortex. In *V. rosea* the new tissue was less organized but contained pockets of xylem scattered throughout the mass. This tissue continued to grow *in vitro* and showed all the external characteristics of tumour tissue. It is concluded that a tumefacient agent is present in bacteria-free crown-gall tissue capable of converting normal into tumour tissue.

HODGSON (R.), RIKER (A. J.), & PETERSON (W. H.). **A wilt-inducing toxic substance from crown-gall bacteria.**—*Phytopathology*, xxxvii, 5, pp. 301–318, 2 figs., 1 graph, 1947.

Filtrates from cultures of crown-gall bacteria (*Phytomonas* [*Bacterium*] *tumefaciens*) induced in the leaflets of Bonny Best tomato and other plants, e.g., sunflower, marigold [*Calendula officinalis*], and peas, wilting followed by necrosis. Under standardized conditions the approximate quantity of toxin in the filtrates was measured by an assay involving filtrate concentration, solution intake, and severity of wilting (toxic index). The toxic substance was thermostable in neutral solution, labile when heated in strong acid solution, non-volatile, water-soluble, relatively insoluble in most organic solvents, and dialysable. After alcoholic fractionation of the filtrate, much of the toxic activity appeared in a fraction precipitated in 90 per cent. alcohol which consisted largely of a previously studied glucosan [*R.A.M.*, xxi, p. 409]. Pure preparations were tested and found to induce wilting similar to that of the entire filtrate. The toxic substance would seem, therefore, to be the glucosan.

LURIA (S. E.). **Recent advances in bacterial genetics.**—*Bact. Rev.*, xi, 1, pp. 1–40, 1947.

The 184 contributions included in this survey of progress in the field of bacterial genetics are discussed under the headings of (I) analysis of spontaneous mutability, (II) increase in mutation frequency produced by non-specific agents, (III) bacterial mutation and the genetic determinants of bacteria, (IV) specific induction of mutations, (V) fusion and sexuality mechanisms, and (VI) selection phenomena and evolutionary considerations.

PIJPER (A.). **Methylcellulose and bacterial motility.**—*J. Bact.*, liii, 3, pp. 257–269, 27 figs., 1947.

Solutions of methylcellulose sold as 'methocel' by the Dow Chemical Company provide a particularly suitable medium for the study of bacterial motility, as they possess sufficient viscosity to slow down the movement and allow detailed observation of it in slow motion. The precipitation of the colloid material on bacterial bodies and appendages is minimal, which is the special advantage of methocel over the solutions used hitherto for this purpose.

A study of motile bacteria of several groups under these conditions leaves no doubt that they propel themselves by means of undulating gyrating movement of their bodies and not by the flagella which are the product of motility and not its cause. The flagellum consists of the outer covering of the bacterium, which is mainly polysaccharide, and through the undulating gyrating movement of the body it is twisted off in the shape of a long spiral tail or as more or less numerous, thin, wavy threads. It appears, therefore, that motile bacteria can no longer be regarded

as rods (bacteria), but must be classed as something like spirilla. The term flagella for bacteria will have to be dropped and replaced by an expression such as 'polysaccharide twirls' or 'mucous twirls'.

Petit (A.). **Remarques biologiques sur les rouilles des céréales. Nouvelles observations sur les rouilles des céréales : moyens de préservation.** [Biological notes on cereal rusts. New observations on cereal rusts: protective methods.]—*Ann. Serv. bot. Tunis*, xvi–xvii, pp. 151–179, 1939–1940; xix, pp. 3–13, 1946. [Received April, 1947.]

In the first of these papers the author states that in Tunisia *Puccinia glumarum tritici* [*R.A.M.*, xxv, p. 388] develops on wheat early in December, *P.g. hordei* on barley towards the end of that month, *P. triticina* on wheat at the end of November, *P. graminis tritici* on wheat and *P.g. hordei* on barley early in February, *P.g. secalis* on rye, *P. coronata* on oats, and *P.g. avenae* on oats in November, *P. simplex* [*P. anomala*] on barley in December, and *P. dispersa* on rye in January. All except *P. g. hordei* and *P. g. tritici* begin to develop as soon as the cereal starts to shoot, the uredospore stage persisting through the winter. The evidence indicates, however, that the rust organisms have several different means of perennating. Wild grasses (except *Aegilops* spp.) seem to play a less important part in this respect than the volunteer shoots of the cereal between autumn and spring. The aecidial hosts are unimportant locally, the rusts developing in the field before the aecidia appear.

Preliminary greenhouse tests indicated that Thatcher and Mahmoudi 552 are highly resistant to *P.g. tritici*, while Roussia shows some resistance; those hard and soft wheats which appear to be resistant escape infection owing to their precocity and the rapid ripening of the grain, both factors depending largely on the sowing date.

P.g. tritici is less prevalent during April and May in certain cold northern parts of Tunisia than in the Sahel and the eastern coastal plains. Thus, the black rusts are found first in the centre and south of the Sahel, and the view that the spores travel from south to north appears to be justified.

In the second paper it is stated that the wheat, barley, oats, and rye strains of *P. graminis*, and *P. dispersa* on rye have been found in Tunisia at the beginning of September following rain. *P. triticina* is present before the autumn-sown wheat is gathered. The appearance of these fungi is attributed to the conservation of the uredospores *in situ*, to volunteer shoots bearing uredospores, and to air-borne infection. A wide extension of black rust may occur locally even without the intervention of wet weather. Transmission by means of volunteer plants occurs in certain years, when rainfall is sufficient, but if the season is dry the rusts do not live on from summer to autumn, re-infection then occurring by means of wind-borne spores. Wind-borne infection appears to be necessary for attack by *P. glumarum.* Most of the cereal rusts have been found locally in winter, summer, and before and during autumn, so that sources of infection appear to be always present. The possibility of control by chemical immunization of the host should be explored. The introduction into Tunisia of barberry should be forbidden. To avoid wheat black rust, late sowing should not be practised.

Chester (K. S.) & Preston (D. A.). **Experimental forecast of Wheat leaf rust in Oklahoma for 1947.**—*Plant Dis. Reptr*, xxxi, 5, pp. 201–203, 1947. [Mimeographed.]

The 1946 forecast for [brown] wheat rust (*Puccinia rubigo-vera var. tritici*) [*P. triticina*: *R.A.M.*, xxv, p. 551] proved to be right. The rust became abundant in Oklahoma just before maturity of the crop. In the autumn there was an unusually heavy epiphytotic on the new crop, but a severe frost (—16° F.) in early January

destroyed nearly all the overwintering spores. On later planted wheat there was better rust survival following the January freeze, but throughout January, February, and March the concentration remained low. Owing to very dry weather during March there was no brown rust increase during this month.

The extensive survey indicated a significantly lower concentration of rust on 1st April, 1947, than in 1945 or 1946. From these findings it is concluded that 1947 in Oklahoma will not be an abnormal year for brown rust and that it will not become seriously destructive, though it may be fairly abundant as the crop approaches maturity.

OORT (A. J. P.). **Stuifbrand specialisatie, een probleem voor den kweker. Onderzoekingen over stuifbrand, III.** [Specialization in Wheat loose smut, a problem for the breeder. Studies on loose smut, III.]—*Tijdschr. PlZiekt.*, liii, 2, pp. 25–43, 2 figs., 3 diags., 1 graph, 1947. [English summary.]

Three specific factor-complexes must be considered in a study of the relation between the wheat plant and the agent of loose smut (*Ustilago tritici*) [*R.A.M.*, xxv, p. 160]. In the first place, the intensity of infection may fluctuate with differences in varietal reaction to infection. For this type of susceptibility, which presumably depends on the rate of spread of the mycelium within the host, the name of 'spreading susceptibility' is proposed. It should not be confused with the susceptibility which includes all the factors determining the occurrence of the disease in the field. 'Spreading susceptibility' is assessed by the percentage of plants attacked and by the severity of infection on the individual plant as expressed, for example, in the number of smutted haulms. The two principles are correlated.

Secondly, irrespective of the rate of mycelial diffusion, the host either does or does not tolerate the infection. In the former case, symptoms are absent or inconspicuous before the smutted ears develop, the reaction of the plant being normal or 'normergical' and the relation between plant and parasite 'eusymbiotic', to adopt Gäumann's terminology [ibid., xxv, pp. 76, 173]. In the latter event the infected plants react strongly, showing symptoms of stunting and distortion as early as the one- to three-leaf stage, at which juncture many plants die. Those recovering remain short but produce healthy ears. Here the reduction is abnormal or 'hyperergical' and the relation between host and pathogen is termed 'parabiosis' [loc. cit.]. The plants are hypersensitive [ibid., xxv, p. 160] and, since they show no smut, field-resistant. The phenomena under discussion may be summed up in the following paradox: immature plants of normal, healthy appearance ultimately give rise to smutted ears, whereas young plants of abnormal, severely diseased aspect, if they survive, produce sound ones.

In the third factor-complex, only small areas of the spikelets of the ear are transformed into smut spores (e.g., stripes on the glumes), the major part retaining a normal healthy appearance. Ear-resistance of this type is often readily recognizable and may be used in the differentiation of physiologic races.

For the differentiation of physiologic races of *U. tritici*, 28 spring wheat varieties were inoculated with ten collections over the five-year period from 1940 to 1944, inclusive. The wheats fell into nine groups, within which nine varieties are recommended for use in the identification of the six physiologic races segregated from the collections, viz., Mindum, Renfrew, Florence × Aurore, Peragis 368/20, von Rümkers Dickkopf (replaceable by Picardie), Little Club, Thew (replaceable by van Hoek), Bersée (replaceable by Carma), and Vilmorin 29. Mindum was resistant to all six races. Renfrew was hypersensitive and field-resistant to race 6 (of German origin) and resistant to all the others. Florence × Aurore was also hypersensitive and field-resistant to race 6, normally susceptible to 5 (from Australia), and resistant to the others. Peragis 368/20 was susceptible to 5 and 6 and resistant to 1 (prevalent on Juliana and van Hoek and presumably the most widespread race in

Holland), 2 (from material of French and German origin tested for several years in Holland), 3 (from imported German winter wheat), and 4 (from Australian and Canadian seed). Von Rümkers Dickkopf was hypersensitive and field-resistant to 1 and 3, susceptible to 2, and ear-resistant to 4, 5, and 6, and Little Club hypersensitive and field-resistant to 1, 3, and 6, and susceptible to 2, 4, and 5. Thew was hypersensitive and field-resistant to race 6 and susceptible to all the others, while Busée and Vilmorin were both resistant to 1, 2, 5, and 6, the former being susceptible to 3 and 4 and the latter hypersensitive and field-resistant to 3 and susceptible to 4. Of the three winter wheats included in the differentiation tests, Jubilé was resistant to all six races, Juliana (Vilmorin 27) susceptible to all, and Astra resistant to 1, 2, 5, and 6, and susceptible to 3 and 4. Winter varieties are, however, less suitable for differential purposes than summer ones owing to the liability of interference by frost.

Two experiments were carried out to ascertain the influence on pathogenicity of a mixture of physiologic races. In the first, Little Club was simultaneously inoculated with a mixture of 4 and 6 in different proportions, the former race inducing a normally susceptible and the latter a hypersensitive reaction. The following percentages of hypersensitiveness were recorded: for 1 part (i.e., 1 gm. spores per l. water) of 6, 92; 1 of 6 and 1 in 1,000 of 4, 92; 1 and 1 in 100, respectively, 83; 1 and 1 in 10, 63; 1 and 1, 39; 1 in 10 and 1, 22; 1 in 100 and 1, 4; and 1 in 1,000 and 1, 6. The data relating to normal susceptibility were lost during the evacuation of Wageningen, but the writer believes this type of infection to have exceeded the hypersensitive by 10 to 20 per cent. In the second test eight varieties were inoculated with a mixture of equal parts of races 1, 4, 5, and 6, resulting in heavy reductions in the incidence of loose smut, notably in the cases of Florence × Aurore, Peragis 368/20, and Ceres.

Cheo (C. C.). **A note on the relation of nematodes (Tylenchus tritici) to the development of the bacterial disease of Wheat caused by Bacterium tritici.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 446–449, 4 figs., 1946.

The wheat disease caused by *Bacterium* [*Pseudomonas*] *tritici* [*R.A.M.*, xiv, p. 571] has so far been found in China only in Hopei and Kweichow, where the disease due to the nematode *Tylenchus* [*Anguillulina*] *tritici* [loc. cit.] is also present. In 1936 field and pot experiments were carried out at Peiping to determine the part played by the nematode in the development of the bacterial disease. Susceptible wheat seeds were sown in field plots and in pots and (1) inoculated with material from galls containing bacteria associated with nematodes, (2) inoculated with the powdered bacterial mass from diseased specimens, (3) inoculated with nematode galls and the powdered bacterial mass, and (4) not inoculated. In May, 1937, all the controls were healthy, no disease developed in set (2), only a few heads covered with yellow exudations as well as numerous heads with nematode galls were produced in those inoculated with nematode galls alone, while a large number of diseased heads, but few with nematode galls, were produced when both bacteria and nematode galls had been used.

The work was resumed in 1940, when pot inoculations were again made, the treatments being (1) uninoculated, (2) inoculation with a pure culture of bacteria, (3) inoculation with galls containing bacteria and nematodes, and (4) inoculation with galls containing bacteria plus nematodes and a pure bacterial culture. The results obtained in this and the next experiment clearly demonstrated that the bacterial disease resulted only when the galls were used as inocula. The same procedure accompanied by soil sterilization showed that the latter had no definite effect on the nematode disease while it slightly increased the bacterial. Surface sterilization of galls had no effect on the subsequent infection induced by them suggesting that the bacteria are carried mainly within the galls. The bacteria

associated with the galls were still alive after $2\frac{1}{2}$ years' dormancy. Examination of the growing points and developing spikes of nematode-infested plants showed that tissues with nematodes may contain no bacteria, but those with bacteria all contained nematodes. In the leaf, only bacteria were observed. Data from 320 plants in pot tests showed that the bacterial disease is more damaging than the nematode disease, over 50 per cent. of the bacteria-infected culms failing to head.

Vallega (J.) & Favret (E. A.). **Herencia de la resistencia a 'Erysiphe graminis hordei' en Cebada. 1. Factores de resistencia en las variedades Monte Cristo y Nigrate.** [Heredity of resistance to *Erysiphe graminis hordei* in Barley. 1. Factors of resistance in the Monte Cristo and Nigrate varieties.]—*Rev. Invest. agric., B. Aires*, i, 2, pp. 81–91, 1947.

The progeny of the F_1, F_2, and F_3 generations of crosses between the Monte Cristo and Trebi, Nigrate and Trebi, and Nigrate and Monte Cristo barley varieties were analysed for their reactions to *Erysiphe graminis hordei* Arg. 1 [*R.A.M.*, xxvi, p. 151]. Monte Cristo is immune from the pathogen, and this character is inherited as a simple dominant factor for which the designation Oi^{me} is proposed. Nigrate is resistant, but its reaction varies with environmental conditions, notably temperature and light. The character for resistance is transmitted as a simple recessive factor, or ^{n}. The variety evidently harbours a recessive factor for the intensification of resistance, together with multiple modifying genes. Trebi is very susceptible to the single physiologic race of *E. g. hordei* hitherto identified in Argentina; it is, however, a useful fodder variety, and the possibility is being studied, parallel with the genetical analyses, of incorporating resistance into it.

Goodman (J. J.) & Henry (A. W.). **Action of subtilin in reducing infection by a seed-borne pathogen.**—*Science*, cv, 2725, pp. 320–321, 1947.

In studying the effects of subtilin, an antibiotic substance produced by *Bacillus subtilis*, on *Xanthomonas translucens* and on the disease which it produces in barley [*R.A.M.*, xxv, p. 553], the authors infected barley seed with the pathogen and treated it with subtilin simultaneously by making up the inoculum with dilutions of subtilin in distilled water. Germination tests showed that *X. translucens* exposed to a 1 to 1,000 dilution of subtilin was largely inactivated as measured by its ability to cause infection in barley seedlings (0·8 per cent. infection in sterilized soil and 0 in unsterilized, whereas a dilution of 1 : 5,000 allowed 41·9 and 25·4 per cent. infection, respectively). Subtilin also reduced infection when applied four to five days after the seed had been infested with the pathogen.

McKay (R.). **A study of Septoria oxyspora Penz. & Sacc. isolated from diseased Barley.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxiv, 6–11, pp. 99–110, 3 pl., 1946.

A full account is given of the author's study of a fungus causing a disease of barley first observed in Ireland in 1931 and reported as a species of *Septoria*. The disease was not observed again until 1945, when it was found in association with *Rhynchosporium secalis* on barley in County Cork and has been identified as a strain of *Septoria oxyspora* [*Lunospora oxyspora*: *R.A.M.*, xxv, p. 157].

The original attack occurred on a strain of Spratt-Archer barley, introduced by the Plant Breeding Division, Albert Agricultural College, Glasnevin in 1931 and appeared as a dark brown spotting of the foliage on the tips of several plants about the middle of June of that year. By the 1st July the disease had spread so extensively that it was obvious from a distance of 20 yards, every plant in the plot being affected. The top leaves of the plants first affected were yellow for one to five inches at the tips, so that for an area of several square yards the ends of the upper foliage appeared as if scorched by fire. Both the yellow patches and the green tissue bore numerous small spots with a greyish centre surrounded by a purplish border.

The yellow patches and grey centres were studded with numerous black pycnidia. Very small spots were entirely brown or dark purple. The spots ranged from 1 to 3 mm. in length, and were mostly elongated in the direction of the leaf. The flag leaf was that most severely affected, often showing only a narrow band of green tissue, from the base half-way up the lamina, all the rest being chlorotic and virtually dead. Diseased spots on the lower leaves were chiefly on the tips and margins. It was evident that the death of the foliage was mainly due to the coalescing spots, narrow strips 2 to 3 cm. long being killed outright. The auricles and bases were not attacked until the rest of the leaf was all but dead. No trace of the condition was found on any of the adjacent plots, comprising 15 foreign barley varieties, as well as native varieties and hybrids. The affected barley was cut and destroyed on 2nd July; the disease recurred on the young foliage sprouting from the base in July and September.

On fresh material the pycnidia were slightly flattened at the top, had the greatest diameter parallel to the vascular bundles, and measured 76 to 119 by 72 to 78μ; the breadth, averaging 77 μ, was more constant than the length. The thin-walled, hyaline, typically more or less crescent-shaped pycnospores were slightly blunt at the keel, bluntly pointed at the apex, and measured 15 to 22 by 2 to 4 (average 18 by 3) μ. In nutrient solutions they reached 30 (average 24) by 4 μ. Inoculations of barley plants in the greenhouse and the fields gave positive results.

In pure culture on various media conidial development was often accompanied by the formation of sclerotia, in which respect the fungus appears to differ from any known *Septoria* so far cultured from small cereals or grasses.

The disease on barley is regarded as having no economic importance at present in Ireland.

Robertson (D. W.), Wiebe (G. A.), & Shands (R. G.). **A summary of linkage studies in Barley: supplement I, 1940–1946.**—*J. Amer. Soc. Agron.*, xxxix, 6, pp. 464–473, 1947.

Since the publication of a summary of linkage studies in barley (*J. Amer. Soc. Agron.*, xxxiii, pp. 47–64, 1941), several additional factor pairs have been studied and a number of contributions made to the knowledge of linkage relations in barley chromosomes. The present paper comprises tables showing (1) genetic factors studied between 1940 and 1946, showing the characters, symbols recommended, previous symbol used, and authority, (2) symbols allotted to characters in unpublished studies from 1940 to 1946, (3) linkage and association reported in studies of barley genetics from 1940 to 1946 (symbols, percentage recombination, and authority), (4) factor pairs showing independent inheritance as reported by workers on barley genetics from 1940 to 1946 (symbols and authority), and (5) two polysomics and polyploids. Among the characters being investigated from the linkage standpoint is resistance versus susceptibility to *Helminthosporium gramineum* [*R.A.M.*, xxv, p. 107], *Ustilago nuda, Puccinia graminis* [ibid., xxv, p. 552], mildew [*Erysiphe graminis*: ibid., xxiv, p. 224], and (unpublished) *P. anomala, Fusarium* scab [*Gibberella zeae*], and *U. hordei.*

Ullstrup (A. J.) & Brunson (A. M.). **Linkage relationship of a gene in Corn determining susceptibility to a Helminthosporium leaf spot.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 606–609, 1947.

Susceptibility in maize to the leaf spot caused by *Helminthosporium carbonum* [*R.A.M.*, xxiii, p. 293] having been shown to be inherited as a monogenic recessive and the symbols *Hm hm* assigned to the genic pair, studies were carried out at the Purdue University Agricultural Experiment Station, Lafayette, Indiana, to determine the linkage relationships involved. Crosses were made between a series of translocation stocks, in which sugary endosperm was used as an indicator for the

chromosomal exchange, and two inbred lines of yellow dent, Pr and K61, homozygous for susceptibility to the pathogen. The F_1 progeny of the several crosses were back-crossed with pollen from double recessives (sugary, susceptible), and the resultant offspring were inoculated at the three- to four-leaf stage with spore suspensions of *H. carbonum* race 1, and the homozygous-susceptible line Pr with red cobs was selected and crossed with a resistant, brachytic, fine stripe-1 linkage tester stock with white cobs. Multiple recessives—white cob, susceptible, brachytic, and fine stripe—in the F_2 were selfed and crossed with red-cob, resistant, normal stocks. The F_1 of the latter cross were back-crossed with multiple recessives and the resultant progenies planted in the field and inoculated with *H. carbonum*.

The tabulated results show a highly significant divergence from an expected 1 : 1 : 1 : 1 back-cross ratio in the progenies involving interchanges between chromosomes 1 and 4, whereas in all others the deviations from the ratio anticipated in independent inheritance were non-significant. Hence it is concluded that the gene, *hm*, conditioning the inheritance of susceptibility to infection by the leaf spot is located on chromosome 1, 32·8 units to the right of the *P* locus and 14·3 to the left of *br*. From the relative frequency of double cross-overs the order of the genes was determined as P—hm—br—f_1.

In this test the severity of disease reaction was appreciably less than is found on susceptible inbred lines, though of sufficient intensity for easy differentiation between resistant and susceptible segregates. The reason for the low level of virulence is unknown.

Minz (G.). **Diplodia natalensis, its occurrence on flowers, button and stem-end of Shamouti Orange, and its relation to stem-end rot and fruit drop.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 152–168, 1 graph, 1946. [Hebrew summary.]

Diplodia natalensis was detected on or in the stem-ends of Shamouti oranges at Rehovoth, Palestine [*R.A.M.*, xxiv, p. 189] a fortnight after fruit set in May, its incidence, however, being lower from then until October than from November, when the fruits attained their full size, until the picking season in April. 'Latent *Diplodia*', here connoting the occurrence of the fungus on or in the tissues after surface sterilization, was found to be most prevalent during March and April, when it was concentrated mainly on the base of the fruit. In its latent form the pathogen was not more abundant on diseased sepals than on healthy ones, but the incidence of 'total *Diplodia*' (comprising isolations from fruits without previous disinfection of the surface) was higher on the former than on the latter and on the stem-ends of fruits with diseased sepals. The fungus attacked the stem-ends of fruits from old groves more extensively than those from young ones, but the amounts of infection on pruned and unpruned trees did not differ appreciably. *D. natalensis* was seldom found in the flowers, on which it is of little or no importance. The stem-end rot is caused by the spores in the stem-end region, which germinate as the season advances and penetrate the fruits by way of the basal tissues.

In these investigations *Colletotrichum gloeosporioides* and *Alternaria* sp. were mainly responsible for the desiccation of sepals or their margins in February and March, though *D. natalensis* was sometimes observed. All three organisms, moreover, are suspected to be concerned in the premature yellowing and dropping of normal-sized fruits.

Presley (J. T.). **Thielaviopsis root rot of Cotton in Mississippi.**—*Plant Dis. Reptr*, xxxi, 4, p. 152, 1947. [Mimeographed.]

In the spring of 1945 and 1946 root rot due to *Thielaviopsis basicola* [*R.A.M.*, xxii, p. 21] caused considerable loss of cotton seedlings, especially on the heavier soils in the northern part of Mississippi and in the Delta. The fungus was found in 30 per cent. of the diseased seedlings in certain fields. The first mature plants

killed by internal collar rot caused by the fungus were observed in 1946. This rot results from seedling lesions, only partially healed, which become active again in early autumn. In Oktibbeha County more than 20 per cent. of the plants were killed in a localized area.

ARNDT (C. H.), BLANK (L. M.), LEHMAN (S. G.), NEAL (D. C.), PRESLEY (J. T.), RAY (W. W.), ROGERS (C. H.), SIMPSON (D. M.), SMITH (A. L.), & YOUNG (V. H.). **Summary of co-operative tests of Cotton seed treatments—1946.**—*Plant Dis. Reptr*, xxxi, 5, pp. 204–210, 1947. [Mimeographed.]

In 1946, cotton seed treatments [*R.A.M.*, xxv, p. 369; xxvi, p. 152] were compared in two tests in 14 plantings in nine of the United States. In the first Du Pont 1452F (ethyl mercury *p*-toluene sulphoanilide) and Dow—9B (zinc 2-4-5 trichlorophenate) were compared at a rate of 3 gm. per kg. (1·5 oz. per bush.) on fuzzy, fuzzy-matted, lightly reginned, lightly reginned-matted, heavily reginned, and acid-delinted seed. In the second, seven treatments were compared on Stoneville 2B cotton seed well infested by the anthracnose fungus [*Glomerella gossypii*]. In both tests Dow—9B and Du Pont 1452F were about equally effective, when the number of seedlings surviving until the final seedling count was used as a criterion of effectiveness. The highest percentage seedling stands were obtained with the delinted treated seed.

Some seed treated with dusts containing 20, 30, and 50 per cent. zinc trichlorophenate were compared in several plantings in North and South Carolina. The 50 per cent. dust tended to be slightly superior, while the 20 per cent. dust was greatly inferior in one planting.

The effectiveness of Du Pont 1452F and Dow—9B was not improved by the addition of fermate or zerlate. Preliminary tests indicated that neither of these dusts at dosages of 10 g. per kg. would destroy *G. gossypii* in the seed.

Progress Reports from Experiment Stations, season 1945–46.—132 pp., 1 graph, London, Empire Cotton Growing Corporation, 1947.

The following items of interest are presented in this report [cf. *R.A.M.*, xxvi, p. 243]. G. M. WICKENS (pp. 20–31) recalls that *Verticillium* wilt of cotton [ibid., xxvi, p. 395] was first found at the Cotton Experiment Station, Barberton, South Africa, in the season 1938–39. By 1945 the disease had steadily become more prevalent, affecting some new fields and rendering them unfit for breeding work. All isolations showed in culture a *Verticillium* producing sparse aerial mycelium with dense black sclerotia and pustules of a readily separable hyaline saltant characterized by dense white aerial mycelium completely lacking sclerotia and which is only slightly pathogenic. The saltant occurs naturally only in association with its sclerotial parent. The causal organism, although herein provisionally designated *V. dahliae* owing to the sclerotial formations, should according to other workers be more properly named *V. albo-atrum*.

In wound inoculation experiments with *V. dahliae* and its hyaline saltant it was found that sclerotial strains proved more virulent to U. 4/5143 than the saltant. The normal incubation period of 19 to 40 days was shortened and the proportion of successful inoculations greater when plants were stripped of young bolls, flowers, and flower buds. There was a mean reduction in yield of about 50 per cent. as a result of infection. The course of disease in inoculated plants was the same as that observed in naturally infected plants and did not spread to neighbouring untreated plants. Greenhouse wound inoculations were made on the Uganda strain BP. 50 and on A. 2106 (U. 4×Cambodia). Plants inoculated with sclerotial strains showed symptoms in 22 days, were severely affected in expanded leaves in 26 days, and were shrivelled and dead by the 36th day. In an elaborate, detailed experiment in which the Uganda strain BP. 50 in cans was soil inoculated by four methods,

a 100 per cent. infection was produced by the addition of 40 gm. of 25 per cent. maize meal-sand inoculum per kg. of dry soil, well mixed. The shortest incubation period by this method was 57 days. When various plants were inoculated by the stem-wound method with hyaline and sclerotial strains, eggplant (var. Black Beauty) was susceptible to both strains, sunflower, tomato (var. Marglobe), and sunn hemp [*Crotalaria juncea*] were susceptible to the sclerotial strain only, while chillies were apparently immune from both. Field observations showed that of 5,299 U. 4/5143 plants set on 2nd January in a field adjacent to the original wilt-infested area, 633 had become infected by the end of August. No cotton had been grown there for five years, maize having taken its place.

The possibility of seed transmission of *V. dahliae* is supported by much circumstantial evidence, but attempts at demonstrating it are unconvincing. Therefore, seed from affected plants has been saved for future testing.

Although stainer (*Dysdercus nigrofasciatus*) population was heavy, internal boll disease (*Nematospora gossypii*) was quite light. Bacterial boll rot (*Xanthomonas malvacearum*) also caused little damage, most infection entering by the boll wall at the base, the remainder via the apical channel left by the incomplete fusion of the carpels, a common feature of U. 4 cotton. Bolls of U. 4/5143 were inoculated in the field with *N. gossypii* [ibid., xxvi, p. 28] by both stainer and needle injection, the latter producing a more severe infection which became progressively less severe, however, with increasing age of boll at the time of inoculation. *Alternaria* [? *macrospora*, ibid., xxvi, p. 14] was common on senescent leaves, a chromogenic, shyly sporing strain and a non-chromogenic, freely sporing strain both having been isolated from leaf spots of identical appearance.

Of the diseases affecting other crops, *Fusarium* wilt of sunn hemp caused appreciable damage to two fields. Death of a few trees in the *Cassia siamea* windbreaks was attributed to a ? *Ganoderma* sp.

G. S. Cameron (pp. 46–47) reports that in Southern Rhodesia the leaf symptoms of *Alternaria* were quite prevalent in the young crop during the over-abundant rainfall in January and February on crops which had not received compost.

S. H. Evelyn of the Gezira Station reports (pp. 51–59) that in leaf curl [cotton leaf curl virus] resistance tests, in the Anglo-Egyptian Sudan, progenies of resistant Domains Sakel and Masseys Domains Sakel both possess resistance genes and that selection is having a decided positive effect. There was hardly any difference between BAR. 1730L and X. 1730A [ibid., xxv, p. 500] as regards hair and spinning value. Resistant BAR. 4/5 was slightly more even and less neppy than X. 1730A and had a slight advantage in yarn appearance, but they were practically identical in strength and spinning quality. X. 1730A was slightly superior to resistant BAR. 4/11 in all major hair and spinning qualities.

At the Shambat station R. L. Knight (pp. 61–66) [ibid., xxvi, p. 200], in the production of blackarm-resistant Egyptian varieties, carried the resistance genes B_1, B_2, and B_3 to the fifth back-cross stage, seed of the sixth having been produced for 1946–47 sowing. A small area of ninth back-cross X. 1730, homozygous for both B_2 and B_3, was propagated as well as a small plot of B_1B_3 1730, grown as a stage in the synthesis of a type carrying all three resistance genes. Under conditions in which blackarm was excluded as far as possible, BAR. 1730L and X. 1730A were found to be almost equal in lint yield and spinning quality, although the seed came from Shambat (usually much inferior) and Gash, respectively. It is probable that BAR. 1730L will now be tried on a commercial scale and sown earlier than is possible with the present susceptible X. 1730A main crop.

From Uganda J. D. Jameson reports (p. 81) that *Alternaria* and associated fungi caused considerable damage to cotton between Entebbe and the Tanganyika border along the shore of lake Victoria where drought occurred on the very acid soil. Resting the soil under elephant grass [*Pennisetum purpureum*] probably alleviates the trouble.

P. E. WEATHERLEY (pp. 85–86) reports that six blackarm-resistant selections from N. 17 and B. 181, and a bulk mixture of resistant selections from BP. 50R were compared with their parental types and other commercial varieties. The best resistant N. 17 derivative gave a lint yield of 79 lb. per acre above the average for the commercial N. 17 bulks. As in the previous year, both in seed and district trials, B. 181 and its derivatives gave the highest lint yield, the best being 237 lb. per acre, and they were the most markedly resistant. In spinning tests B. 181 gave the strongest yarns in one district, and seed is being increased.

According to J. E. PEAT (pp. 97–98) reporting from the Lake Province of Tanganyika, *X. malvacearum* badly attacked stunted native cotton in the Ukiriguru area killing young plants and distorting poorly grown ones. Serious manifestations were also observed in the U. 4 Sea Island hybrid material and it is thought that two seasons of heavy early rains followed by drought may be responsible for both attacks. In other parts of the area where growing conditions were better the plants outgrew the attack.

H. C. DUCKER reports from Nyasaland (p. 116) that circumstantial evidence suggests that boll shedding not due to boll worms [*Diparopsis castanea*] may be connected with susceptibility to blackarm. Although no proof has yet been found to substantiate the statement, blackarm seems to be less of a limiting factor in Nyasaland than it is in more northern countries.

DRECHSLER (C.). **A nematode-strangling Dactylella with broad quadriseptate conidia.**—*Mycologia*, xxxix, 1, pp. 5–20, 2 figs., 1947.

Continuing his researches on Hyphomycetes capturing nematodes [*R.A.M.*, xxv, pp. 341, 393; xxvi, p. 106], the author describes a new species occurring on decaying leaves of beech (*Fagus grandifolia*) and named by him *Dactylella coelobrocha* n.sp. The organism captures and consumes various nematodes, including *Plectus parvus*, *Rhabditis* spp., and *Wilsonema* sp.

EGLITIS (M.). **Beitrag zur Mikroflora der Leinpflanzen von leinmüdem Boden.** [Contribution to the microflora of Flax plants from Flax-sick soil.]—*Contr. Balt. Univ. Pinneberg* 12, 14 pp., 1947. [English abstract.]

Thielavia [*Thielaviopsis*] *basicola* [*R.A.M.*, ix, p. 783], *Fusarium* spp., and *Colletotrichum lini* [*C. linicola*] were determined as the principal agents of flax root rot on 440 plants from flax-sick soil at Schönberg, Moravia (Czechoslovakia), followed by *Polyspora lini* [ibid., xxvi, p. 55] and *Stachybotrys alternans* [cf. ibid., xxi, p. 370; xxiv, p. 276]. The aerial organs of the plants were attacked chiefly by *C. linicola*, *F.* spp., *Alternaria tenuis*, and *Cladosporium herbarum* [ibid., xxiv, p. 451]. The parasitism of two of the foregoing species, namely, *S. alternans* and *A. tenuis*, is doubtful. Other fungi of minor importance included species of *Mucor*, *Phoma*, *Oospora*, *Cephalosporium*, *Penicillium*, *Acremoniella*, *Trichothecium roseum*, and *Cladosporium epiphyllum*.

Some of the 49 varieties and selections represented in the investigation, e.g., Eckendorfer Früh, Roland, and Meschenmok, were infected by only two or three pathogens, whereas 12 were found on Buda. However, the experimental area was too small, and the number of observations too few, for definite conclusions as to varietal reaction to be drawn.

EGLITIS (M.). **Ergebnisse der Resistenzprüfung des Leins für Colletotrichum lini Manns et Bolley. I. Bericht.** [Results of the testing of Flax for resistance to *Colletotrichum lini* Manns & Bolley. First report.]—*Contr. Balt. Univ. Pinneberg* 30, 16 pp., 1947. [English summary.]

The following method was devised in 1945 at the former Kaiser Wilhelm Institute for Bast Fibre Research (now Výzkumný ústav Lnářský v Temenici u Šumperka),

Schönberg, Moravia (Czechoslovakia), for the testing of flax samples for resistance to *Colletotrichum lini* [*C. linicola*: see preceding abstract]. Conidial suspensions of an aggressive German isolate of the fungus from the Roland variety, grown on carrot juice agar, were inoculated between 16th February and 27th September into 6- to 11-day-old seedlings in clay dishes filled with loamy compost (120 seeds per dish) in the greenhouse. The dishes were covered with bell jars from sowing until the emergence of the seedlings and again for four days after inoculation, during which period the inner walls were sprinkled with water to maintain the necessary high degree of atmospheric humidity.

Of the 203,116 seedlings produced by 2,621 samples, 1,641 (0·8 per cent.) from 269 samples were resistant, mostly winter flax from the Mediterranean region, together with some hybrids bred at the Institute. In 57·4 per cent. of the plants both stems and cotyledons were attacked, while in the remaining 42·6 the former were healthy. Should this relationship be maintained after further testing it may find practical application in flax-breeding.

McCulloch (Lucia). **Notes on a brown pigment and other unusual characters in cultures of Bacterium marginatum.**—*Phytopathology*, xxxvii, 5, pp. 349–353, 2 figs., 1947.

On Thaxter's potato agar at pH 5 to 5·5, *Bacterium marginatum* [the agent of scab and neck rot of *Gladiolus*: *R.A.M.*, iv, p. 287, *et passim*] produces consistently, in addition to the usual rather featureless cells, numerous evanescent, hyaline spheres, mostly mere dots in size though many are 4 to 7 or up to 20 μ in diameter, which are succeeded by fewer but larger, permanent brown spheres, predominantly 0·5 to 0·8 μ but frequently measuring 5 to 25, occasionally 40 to 45, and in one instance 60 μ. Unlike the readily staining hyaline spheres, the brown ones are extremely resistant to the many chemical reagents tested. With age, if the medium remains moist, the brown spheres, especially the larger specimens, develop a hyaline wall, which usually breaks away from the brown centre and may finally undergo further disintegration into the small, hyaline, ephemeral type. Brown bacteria, frequently of abnormal size and shape, also occur on the same substratum.

Embedded in the cleared agar below the bacterial growth are numerous sphaerocrystals, 5 to 35 μ in diameter, composed of radiating, acicular parts. Since they are formed only in starch-containing media (*J. agric. Res.*, xxxix, pp. 495–501, 1929) and stain blue with iodine, it is thought that they may represent some form of starch. Mobile mycelioid forms, 2 to 200 μ in length, develop profusely in 2 to 3 per cent. dextrose or galactose solutions and occasionally on potato agar.

Davidson (R. W.) & Mielke (J. L.). **Fomes robustus, a heart-rot fungus on Cacti and other desert plants.**—*Mycologia*, xxxix, 2, pp. 210–217, 3 figs., 1947.

Wood-decaying Hymenomycetes have not previously been reported as causing decay of the woody skeleton in living cacti. Specimens of a *Fomes* found at the base of the arms of living giant cacti (*Cereus giganteus*) and at the base of injured main stems and on other cacti and desert shrubs in Arizona in 1941 were received for identification at the Division of Forest Pathology, United States Department of Agriculture. A comparison of pure cultures from fresh sporophores of the *Fomes* on cacti with cultures of other *F.* spp. showed that they resembled most closely cultures of *F. robustus* from oaks [*R.A.M.*, xxi, pp. 56, 396]. The fungus is considered to be that species although the sporophores of the cactus *Fomes* were smaller and more rimose than typical ones of *F. robustus*. On *Cereus* the fungus is most commonly found on hard, bark-like outer tissues. The broken-off basal ribs were badly rotted. On *Opuntia* spp. the sporophores develop near ground-level at branch

stubs or woody areas exposed by injury. Decay extends upwards, occasionally to a height of 4 ft. or more. The rotting of the woody skeleton near the base causes the plants to fall over.

FAULL (J. H.). **Tropical Fern hosts of rust fungi.**—*J. Arnold Arbor.*, xxviii, 3, pp. 309–319, 1947.

Lists are given in tabular form of the published tropical fern hosts, their rusts, and location, together with new records for tropical fern hosts of rust fungi found in South America and the neighbouring island groups.

VOLCANI (TEMIRA). **Powdery mildew on the leaves of Dodonaea viscosa Linn.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 181–185, 1 fig., 1946. [Hebrew summary.]

The agent of a powdery mildew of *Dodonaea viscosa* leaves, observed for the first time in Palestine in 1945, is described as a new species under the name of *Oidium dodonaeae* I. Reichert & T. Volcani. The pathogenicity was proved by inoculation.

NATTRASS (R. M.). **A disease of Pyrethrum in Kenya.**—*Nature, Lond.*, clx, 4056, pp. 120–121, 1 fig., 1947.

Pyrethrum (*Chrysanthemum cinerariifolium*), grown in Kenya for commercial purposes, showed no serious disease until June, 1946, when on the Mau Escarpment, one of the most productive areas, a serious decrease in yield was observed, estimated in some instances to be as high as 80 per cent. Although the plants themselves looked healthy, the flower buds failed to develop because of an attack of *Ramularia bellunensis* [*R.A.M.*, xvii, p. 584]. The disease rarely extended below the apical inch or so of flower stalk and seldom spread to the foliage. If it did, no definite spots were formed on the leaves, but the infection started from the tip of the segments and extended inwards. The conidiophores were abundantly developed on the inner surfaces of the involucral scales, fragments of which were easily distributed with the seed.

By the end of 1946 the disease had spread to all the chief pyrethrum areas with the exception of the Nyeri–Nanyuki region on the slopes of Mount Kenya which, up to April, 1947, had remained free. It appears that this is the first record of the pathogen on *C. cinerariifolium*.

SYKES (S. M.). **Mould wastage in the storage and transport of fruit.**—*Agric. Gaz. N.S.W.*, lviii, 4, pp. 201–204, 1947.

A brief, popular account is given of the factors conducive to mould wastage during the storage and transport of fruit (i.e., pre-harvest factors and those related to picking, handling, grading, packing, and storage) in New South Wales and of the means by which the losses sustained may be minimized.

HUTTON (K. E.). **Bitter pit of pome fruits.**—*Agric. Gaz. N.S.W.*, lviii, 4, pp. 205–208, 6 figs., 1947.

In New South Wales apple varieties of commercial importance which are susceptible to bitter pit [*R.A.M.*, xxii, p. 488; xxiv, p. 92] are Granny Smith, Delicious, Jonathan, Democrat, Rome Beauty, McIntosh Red, Crofton, Dougherty, and Stayman Winesap.

In the 'tree pit' form of the disorder every fruit may be affected, or only a few or all the fruits on a single branch. Early pickings are not likely to show tree pit until reaching the market, as the external symptoms may be slight at picking; in later pickings the symptoms are immediately apparent.

If fruit which would later develop pit on the tree is placed in storage, the 'storage pit' condition will develop as ripening proceeds. On the other hand, fruit which would not have pitted on the tree should not pit in store, provided picking takes place when the fruit has reached proper storage maturity. The chief cause of the development of storage pit appears to be picking while the fruit is relatively immature. The safe-picking maturity stage varies, particularly with light crops of susceptible varieties, and its recognition depends on experience. It is, however, essential that the picking date should be decided on the basis of maturity and not on size alone. Bitter pit in overseas shipments can be much reduced by later picking and prompt removal to cool storage.

Additional control methods include light pruning (aiming, in the case of susceptible varieties, at securing a regular, evenly distributed crop), proper drainage, suppression of excessive weed growth during dry periods, avoidance of manuring during the growing period and of irrigation when the fruit nears maturity, and delaying picking of susceptible varieties so that tree pit will have time to show and the affected fruits can be discarded.

HOWARD (F. L.). **Organic mercury fungicides as foliage sprays.**—Reprinted from *Agric. Chemicals, 1946*, 4 pp., 5 figs., 1946.

During 1942 a preliminary field trial carried out in Rhode Island on the use of organic mercury salts (phenylmercuri triethanol ammonium lactate and related derivatives) against apple scab [*Venturia inaequalis*] proved highly successful. Subsequent laboratory studies indicated that the concentrations giving L.D. 50 and L.D. 90 values for spore germination of *Macrosporium* [*Stemphylium*] *sarciniforme* [*R.A.M.*, xxii, pp. 101, 145] and *Sclerotinia fructicola* were 1 p.p.m. and 3 p.p.m., respectively, in water. As the formula was improved the toxic concentrations were reduced to 1 and 0·5 in 10,000,000, respectively. It was considered that a practical concentration against plant pathogens would lie somewhere between 50 and 200 p.p.m.

Phytotoxicity studies showed that a concentration of 1 : 10,000 was not noticeably injurious to apple foliage, while controlling *V. inaequalis*; in some cases a concentration of 1 : 80,000 was able to prevent apple scab.

The tenacity of the water-soluble organic mercury fungicides was such that in laboratory tests 120 washings reduced the fungitoxicity of the residue on glass slides by less than 10 per cent.

Laboratory tests also demonstrated that up to 200 p.p.m. of calcium salts could be added to a 1 : 16,000 solution of phenylmercuri triethanol ammonium lactate without any significant decrease in fungitoxicity. Both laboratory and field tests showed that when organic mercury compounds were combined with DDT neither seemed to decrease the fungicidal or insecticidal value of the other. In combination with summer spray oils they showed no reduction in disease-control power.

In four years' trials no injury or discomfort resulted to the men engaged in spraying.

Chemical analyses of apples after being sprayed with the organic mercury compound gave conflicting data on the amount of mercury residue. Pending more information on the possibly poisonous nature of the residue, the use of organic mercurials should be confined to applications up to the first cover spray.

ENGLISH (H.), RYALL (A. L.), & SMITH (E.). **Blue mold decay of Delicious Apples in relation to handling practices.**—*Circ. U.S. Dep. Agric.* 751, 20 pp., 2 figs., 1 graph, 1946.

Studies conducted from 1938 to 1943 in Washington, D.C., to ascertain the effect of various handling practices on the development of blue mould (*Penicillium*

expansum) [*R.A.M.*, xxiv, p. 22] in Delicious apples from the upper Yakima Valley, showed that more open lenticels and greater amounts of lenticel and washing-injury decay occurred on fruit washed in sodium silicate (80 lb. to 100 gals. water) at 110° F. followed by 1·5 per cent. hydrochloric acid at 100° than on unwashed when both were dipped in a spore suspension of the fungus before packing. On the other hand, unwashed fruit similarly inoculated developed more lenticel infection than comparable washed fruits packed without artificial inoculation. Evidently, therefore, unwashed fruit with a high natural spore population might develop more decay than fruit washed under sanitary conditions and rinsed in clean water, even though the washed fruit may be more susceptible to decay. Severe washing, however, increases both the number of open lenticels and the proportion of lenticel infection.

Three days' delay in a non-refrigerated warehouse decreased susceptibility to washing injury and blue mould. While this delay is not recommended as a practice, it is pointed out that increased decay and washing injury might develop if immediate washing and packing were adopted in the absence of concurrent precautions to reduce the spore population and the severity of the washing.

No evidence was obtained that storage for some weeks at 32° before washing and packing makes the fruit more susceptible to washing injury and decay than those washed immediately. On the contrary, cold storage for two to ten weeks before washing resulted in increased resistance to washing injury in proportion, usually, to the length of storage. Six weeks' cold storage before washing resulted in the greatest resistance to infection. Whether the fruit was wet or dry when packed had no effect on infection.

When apples were passed through a washing solution heavily contaminated with *P. expansum* spores and then rinsed in relatively clean water only a slight increase in decay resulted; on the other hand, when unwashed fruit was subjected to a special rinse with a high spore population, infection was considerably increased. A thorough final rinse in clean water is considered important in the control of blue mould decay.

Susceptibility to *P. expansum* varied in fruit from different orchards and in that from the same orchard in successive seasons.

The importance of careful handling in the control of blue mould is indicated by the fact that many lenticel infections were found in bruised areas.

Isolations from lenticel infections which appeared different from those caused by blue mould yielded *Phialophora malorum* in all but one instance, in which an unidentified *Penicillium* was obtained. Fungi from lesions at other infection sites included (in descending order of frequency) *P. expansum*, *Botrytis cinerea*, *Phialophora malorum*, *Hormodendrum cladosporioides*, *Alternaria* sp., and *Neofabraea perennans* [ibid., xxv, p. 170].

Heim (R.). **Notes de phytopathologie africaine. 1. La pourriture de la hampe du Bananier en Guinée française.** [Notes on African phytopathology. 1. Main-stalk rot of Banana in French Guinea.]—*Rev. Mycologie, Suppl. colon.*, xi, 1, pp. 20–28, 1946.

This article forms the first of a series embodying the results of studies on banana diseases in French West Africa and is concerned with main-stalk rot, the principal agents of which are *Thielaviopsis* [*Ceratostomella*] *paradoxa* and *Gloeosporium musarum* [*R.A.M.*, xvi, p. 394; xix, p. 551, *et passim*]. The rot affects bananas in central America, the Antilles, Brazil, Colombia, India, and during recent years in the Canary Islands and West Africa. In 1940 the reception of four specimens with typical main-stalk rot from a consignment arriving at Bordeaux from Konakry, French Guinea, provided material for the completion of the West African studies. Isolates from the four specimens included the pathogenic species *C. paradoxa*, *G. musarum*, *Mucor mucedo* [ibid., xii, p. 39], and *Oidium* [*Oospora*] *lactis* f. *musarum*

[loc. cit.], and the saprophytes *Penicillium crustaceum* [loc. cit.], *Spicaria carnea*, and *Bacterium* [*Xanthomonas*] *solanacearum* [ibid., xxv, p. 267]. The methods of infection of these organisms were studied, two outstanding points emerging, that (*a*) fruit was infected only after the harvest and during transport, and (*b*) the organisms entered via wounds or open places on the stems. It is possible that *G. musarum* can live within the fruit for several weeks before any symptoms become apparent. From studies of the temperatures best suited to the development of the two major fungi [loc. cit.] and of transport conditions in relation to infection it was found that high temperatures (24° to 30° C.) favoured growth. No more than 36 hours should pass between picking and loading for transport, and the average temperature of 11° to 12° should be reached and maintained in the storage chambers within 48 hours of the loading. The sealing of stem ends and wounded surfaces has been found useful as a preventive against the disease [ibid., ix, p. 729]. Paraffin wax and paraffin oil have given the best results for this purpose and powdered or crystalline boric acid and 10 per cent. colloidal sulphur were useful as fungicides. If initial infection occurs before loading, the stems will become diseased if the voyage lasts longer than 12 days. Special emphasis is placed on the fact that correct transport conditions can do much to prevent the disease.

SAKIMURA (K.). **Thrips in relation to gall-forming and plant disease transmission : a review.**—*Proc. Hawaii. ent. Soc.*, xiii, 1, pp. 59–94, 1947.

Studies in the field of plant-disease transmission by thrips have been actively pursued of recent years, and numerous references are now available to supplement the reviews of the subject by Bailey (*J. econ. Ent.*, xxviii, pp. 856–863, 1935) and the author (*Proc. Hawaii. ent. Soc.*, ix, pp. 415–427, 1937). The section on plant disease transmission (pp. 63–86) is concerned with toxaemias, bacterial and fungous diseases, and viruses. The [tomato] spotted wilt virus is the only plant virus disease authentically demonstrated to be transmissible by thrips, and in this connexion the problem of its vectors in relation to the Hawaiian pineapple industry is briefly discussed [cf. ibid., xvii, p. 828; xxv, p. 567].

ELAZARI-VOLCANI (ZAPHRIRA). **Bacterial rot of Avocado fruit.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 169–180, 1 pl., 1946. [Hebrew summary.]

A bacterial rot of an unripe Guatemalan Seedling avocado fruit was observed for the first time in Palestine in March, 1946. It was dry, hard, greenish, and spread from the distal end over about a third of one side. The infection penetrated deeply into the parenchyma, causing marked hardening and a dark discoloration of the tissues. The darkening extended to the vessels, though these were not actually invaded and only an occasional cell of the surrounding xylem contained bacteria. The typical symptoms of the rot were reproduced in the two winter varieties, Guatemalan Seedling and Nabal, pricked and inoculated at the distal end, but no infection resulted in fruits similarly treated at the stem or in uninjured ones inoculated at either site. The Ganther summer variety reacted similarly to inoculation at the distal end except that the fruits softened after five days instead of 18, as in Guatemalan Seedling. The organism isolated from the infected tissues and grown on nutrient agar at 25° C. corresponded in the main with *Pseudomonas syringae*. The colonies of the avocado bacterium, however, are creamy-white instead of greyish-white with a blue tinge, while another differential feature is the absence on the infected fruits of the prominent, cracked crust described by W. T. Horne as typical of *P. syringae* on avocado in California [*R.A.M.*, xiv, p. 707]. The Palestine avocado bacterium, presumably representing a local variant of *P. syringae*, was inoculated into Shamouti oranges and Eureka lemons, on which it induced the characteristic symptoms of black pit, and was reisolated from the diseased tissues.

ADSUAR (J.). **Studies on virus diseases of Papaya (Carica papaya) in Puerto Rico. I. Transmission of Papaya mosaic. II. Transmission of Papaya mosaic by the green Citrus Aphid (Aphis spiraecola Patch). III. Property studies of Papaya mosaic virus.**—*Tech. Pap. P. R. agric. Exp. Sta.* 1, 2, 4, 26 pp., 6 figs., 1946.

During a reinvestigation of papaw mosaic in Puerto Rico, three diseases, presumably caused by virus infection, were identified. The bunchy top disease [*R.A.M.*, xxv, p. 305; xxvi, p. 402] is the most common; it was first reported from the island in 1931 and assumed epidemic proportions during 1937 and 1938. It involves stunting, failure of latex flow, and slow growth of short, stiff, horizontal petioles. The leaves are small, thick, and chlorotic. A less prevalent type, sometimes called die-back, shows severe chlorosis and defoliation from below the growing point, progressing downwards and usually followed by necrosis of the tip of the stem or the whole plant. A typical mosaic disease replaced these two types in a small area including Guanica and Ponce. It is characterized by stunting, oily spots on the stem and petioles, extreme foliar distortion and mottling, uninterrupted latex flow, and by green and brown rings on the fruits. All three types show a marked reduction of top growth and sudden appearance of green streaks on the stem and young petioles. Bunchy top and die-back are almost always characterized by failure of latex flow, whereas the mosaic type seldom shows this.

In transmission experiments with the papaw mosaic, healthy papaw plants 1½ to 3 months old, grown in 6-in. pots in the greenhouse, were used. Eleven out of 29 plants were infected by the pin-puncture method and 23 out of 28 by the use of carborundum. The disease was also transmitted by grafting. Typical field symptoms developed, but with more severe atrophy and leaf distortion.

The papaw mosaic diseases reported from other countries [ibid., xviii, p. 808], although having some features in common with the Puerto Rico disease, do not show the characteristic mottling and extreme distortion of the leaf. The author considers that only the Cuba mosaic type B reported by Acuña and De Zayas [loc. cit.] seems to be identical with the mosaic under consideration.

The papaw mosaic was also successfully transmitted by means of the green citrus aphid (*Aphis spiraecola*). Fifteen out of 33 plants were infected by *A. spiraecola* fed on diseased papaw leaves for varying periods from eight minutes to one hour. Both nymphs and adult insects transmitted the disease. All controls remained healthy. The evidence seems to indicate that the aphids are non-viruliferous while on citrus leaves and that they must acquire the virus during their migration.

The virus is inactivated by a 10-minute exposure at 60° C. and in 48 hours at room temperature. No infection was obtained at dilutions greater than 1 : 1,000. The virus passed with difficulty through a Seitz filter No. 5114–C 10. Leaves air-dried for 48 hours lost their infectivity. *A. spiraecola* retained the virus for three hours, but failed to infect plants after that time.

BALAKRISHNAN (M. S.). **Phytophthora palmivora Butler on Cyphomandra betacea Lendt. and Carica papaya Linn.**—*Curr. Sci.*, xvi, 5, pp. 146–147, 1947.

Two isolates of *Phytophthora*, one from the stem of tree tomato (*Cyphomandra betacea*) with patch canker at the Fruit Station at Burliar, the other from a rotten hollow stem of papaw in Coimbatore, did not produce any oospores in pure culture even after three months. When grown in paired cultures with known plus and minus strains of *P. palmivora* from the culture collection at Coimbatore, the *C. betacea* isolate formed no oospores with two *Areca* strains, one *Colocasia*, and one tomato strain, whereas they were formed in four days when the papaw strain was used [cf. *R.A.M.*, viii, p. 527; xi, p. 205]. The tree tomato strain formed them within four days, however, when grown with the papaw strain or with other strains from *H*[*ibiscus*] *esculentus*, *Spondias*, and *Areca* with which the papaw strain formed

no oospores. The latter is considered to be a minus strain and the *C. betacea* isolate a plus strain of *P. palmivora*.

WAIN (R. L.) & WILKINSON (E. H.). **Studies upon the copper fungicides. VII. The solution of copper from dressings on Pea seed. VIII. The penetration of copper into germinating Peas. IX. Investigations with the exudate from fungus spores.** —*Ann. appl. Biol.*, xxxii, 3, pp. 240–243, 243–247, 1945; xxxiii, 4, pp. 401–405, 1946.

In further studies on the copper fungicides [cf. *R.A.M.*, xxiii, p. 138] it was found that pea seeds of the varieties Foremost, Surprise, and Eclipse, while swelling in water, exuded substances which were capable of dissolving insoluble copper seed dressings whether on the seed or used separately. Copper, in dried 4–4–50 Bordeaux mixture, readily passed into solution in water in which peas had been soaked, indicating that soluble complex forms of copper had been formed. It is suggested, on the basis of chemical analyses, that both the fungicidal and phytocidal actions of copper dressings on pea seeds depend mainly on the action of the exudates, notably colloidal protein-like material and amino derivatives, in bringing copper into solution.

In the second paper it is stated that pea seed of the same three varieties showed less injury when treated with solutions of simple cupric salts than when treated with solutions of equivalent strength containing complex forms of copper. When supplementary pea exudate was added to peas germinating in copper sulphate solution greater damage was caused than without the addition. Nevertheless, in spite of the greater phytotoxicity of the complex forms of copper, the copper intake by the seeds was less. Colorimetric tissue tests and chemical analyses of treated peas showed a high concentration of copper in the testa and radicle and only small amounts in the cotyledons. The part fixed on the testa provides fungicidal protection. The main cause of injury in treated seeds is considered to be due to the effect on the radicle of the phytocidal, soluble, complex forms of copper produced by the exudate.

In the third study the amounts of copper dissolved from pure copper compounds by water, by a standardized solution of the exudate of *Neurospora sitophila* spores, by standard solutions of malic and succinic acids and their sodium salts, and by glycine and mannitol, were determined. Compared with the known fungicidal activities of the copper compounds [ibid., xxii, p. 148], the results demonstrated that the amounts of copper yielded to water and to the standardized spore extract or glycine solution provide an indication of fungicidal properties. While soluble copper in excess of that dissolved by water can only appear from alkaline Bordeaux deposit by complex ion formation, it was ascertained that this is not the only means by which copper can dissolve from other copper compounds.

Mannitol, succinate, and fumarate isolated from the spore exudate were unable to dissolve appreciable amounts of copper from alkaline Bordeaux deposit. Malate was not detached in the exudate of *N. sitophila* spores grown on malt agar. The quantity of mannitol in the spore exudate depended on the medium on which the fungus was grown.

KNORR (L. C.). **Common names vs. initials for the designation of new fungicides.**— *Plant Dis. Reptr*, xxxi, 5, pp. 211–212, 1947. [Mimeographed.]

The author deplores the increased use of initial letters for the designation of new chemicals and views with alarm the confusion which will result if the practice is continued. At a recent conference it was proposed to use for new insecticides standard short common names which would be defined and registered with the United States Patent Office to pre-empt its use as a trademark name.

Plant pathologists have not used initialling to as great an extent as entomologists and it is hoped that when common names are given to new chemicals, easily remembered names will be chosen rather than confusing jumbles of letters and figures, which are intelligible only to a chemist.

MAUBLANC (A). **Les champignons de France. Troisième Édition.** [The fungi of France. Third Edition.]—cclxxvii+283 pp., 240 pl. (224 col.), 57 figs., Paris, Paul Lechevallier, 1946. Two vols., 850 fr.

These two small volumes, while intended primarily for amateurs, aim at being something more than merely popular handbooks. In addition to the original coloured plates they contain 32 new ones (16 in each volume) by M. Porchet. The first volume contains a general introduction to mycology (general characters of the fungi, geographical distribution, influence of climatic factors on fungal vegetation, influence of the soil, natural sites of fungi, and seasons at which they appear), and deals with the classification. The anatomical characters and the criteria used in the classification of the Basidiomycetes are described and figured, followed by a detailed treatment of the Agaricaceae. The second volume deals with the remaining families of Basidiomycetes and the larger Ascomycetes, and the toxicology of the poisonous species. The plates illustrate selected species in different stages of development, the spores being shown at a magnification of $\times 500$ and the cystidia at $\times 250$. There is an index to the French names of the fungi, another to the German, English, Italian, and Spanish, and a third to the Latin names. Keys are provided for the determination of the genera, and opposite each coloured plate under the Latin name there is a description of the fungus.

WILSON (E. E.). **The vertical dispersion of spores in the air near the ground by winds of low velocity.**—Abs. in *Phytopathology*, xxxvii, 5, p. 365, 1947.

During overcast periods when thermal turbulence was weak or absent [? in California], the relatively large (33 μ) spores of *Lycopodium* were borne upwards when released 3 ft. from the ground into air moving between 0·6 and 5·4 miles per hour [cf. *R.A.M.*, xxv, p. 404]. Vertical dispersion per unit of downwind distance appeared to reach a maximum at the lowest wind velocity, diminishing rapidly as the latter increased. A similar trend was observed on sunny days when a degree of thermal tubulence was probably present. Ratios pertaining to dispersion downwards from the 3-ft. level likewise declined with an increase in air movement. On an overcast morning with wind velocity of 1½ miles per hour, spores were carried to earth from a height of 3 ft. within a distance of about 12 ft., at which point the number intercepted by the ground increased to about 20 ft. and then decreased.

JOHNSON (E. M.). **Injury to plants by minute amounts of 2, 4-dichlorophenoxyacetic acid.**—*Pythopathology*, xxxvii, 5, pp. 367–369, 1947.

At the Kentucky Agricultural Experiment Station, cabbage, tomato, tobacco, and a number of ornamental plants developed pathological symptoms of various kinds which were found to be due to the use of herbicides containing salts or esters of 2, 4-dichlorophenoxyacetic acid. The injuries occurred in at least four ways, viz., from toxic residues left in spray- or dust-mixing apparatus; vapours from equipment and containers; absorption by roots; and drift of spray or vapours by air currents. The toxic residues of both the ethyl and butyl esters were shown experimentally to remain in metal sprayers after successive washings in hot water and soap, and in strong alkali, but two applications of acetone apparently removed most of the noxious substances. Three washings with tap water sufficed to eliminate the residues of both the ammonium and sodium salts from the appliances.

Hansen (H. N.) & Snyder (W. C.). **Gaseous sterilization of biological materials for use as culture media.**—*Phytopathology*, xxxvii, 5, pp. 369–371, 1947.

The experiments of Whelton *et al.* on the control of microbiological food spoilage by epoxide fumigation [*R.A.M.*, xxv, p. 509] suggested the application of these chemicals to the sterilization of natural substrata for fungus cultures. The following method was adopted. The material is placed in a fruit jar or other container, slightly moistened if necessary, and propylene oxide is introduced at the rate of 1 c.c. per l. capacity of the vessel, which is made air-tight, shaken, and left overnight or longer at room temperature; the fumigant is then allowed to escape and the material is ready for use, either alone or in combination with liquid or solid media. Plant materials, e.g., lucerne hay, pea pods, dry bean straw, wheat seed, youngberry fruit, fresh carrot, dehydrated fruits and vegetables, and the like, insects, or soil mixtures, treated in this manner may be kept indefinitely in the closed containers without loss from microbiological spoilage. Ethylene oxide, though possibly a rather more efficient fumigant than propylene oxide, is explosive in mixtures with air and therefore less suitable for laboratory use. Propylene oxide is inflammable but easily handled, and a small quantity may be kept in a refrigerator at 7° C. ready for use at any time.

Hesseltine (C. W.). **Viability of some mold cultures.**—*Mycologia*, xxxix, 1, pp. 126–128, 1947.

Of 492 mould cultures on potato dextrose agar stored for two years eight months at approximately 7° C., 409 although apparently completely dried were found to be viable and 83 non-viable. In the *Aspergillus niger* group only two of 14 cultures revived, in the *A. wentii* group one out of six, and in the *A. flavus-oryzae* group one out of five. On the other hand, four cultures of *A. fumigatus* all lived, as did all eight of *A. fischeri* and all five of *A. versicolor*.

In a second set of cultures similarly stored for 19 months the results were comparable in that the same highest percentages of non-viable cultures were among the *Aspergillus* spp., while a very low number of non-viable cultures occurred among *Penicillium* spp. and Zygomycetes. It seems important with Zygomycetes to make sure before storage that sporulation has been vigorous and that the spores are fully mature. Cultures contaminated with *Penicillium* or *Aspergillus* were often found to be dead.

Wahl (I.). **On a method of fixing and measuring relative humidity in small closed containers.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 230–237, 1 fig., 1946. [Hebrew summary.]

The method for the determination of relative humidity in closed containers used at the Rehovoth Agricultural Experiment Station is a simplification of that described by Hopp [*R.A.M.*, xvi, p. 112]. It involves the use of super-saturated solutions of various salts in the presence of an excess of the latter, and the growth of the test fungus (without agar) on the inside of the upper cover of the Petri dish. The device used for the measurement of relative humidity is a modified psychrometer, the wet and dry thermometers being replaced by a thermocouple. A moist cloth is wrapped round the thermocouple rod and the temperature of the constant temperature medium is measured by the needle terminal. The accuracy of the measuring device was verified by experiments with super-saturated solutions inducing known percentages of relative humidity. The values thus obtained were reliable within the range of 60 to 90 per cent., beyond which some deviations tended to occur.

Vincent (J. M.). **Distortion of fungal hyphae in the presence of certain inhibitors.**—*Nature, Lond.*, clix, 4051, p. 850, 1947.

The description and figures of hyphal tips growing in the presence of the 'curling

factor' isolated by Brian *et al.* from cultures of *Penicillium janczewskii* [*R.A.M.*, xxvi, p. 117] are stated to be strongly reminiscent of the distortion produced in the hyphae of *Aspergillus niger*, *P. roqueforti*, and *Byssochlamys fulva* [ibid., xxi, p. 206] developing in contact with methyl p-hydroxybenzoate on Czapek's agar at pH4 to 5. Whereas the 'curling factor' induces severe stunting at 6×10^{-6} molar, the concentration of methyl p-hydroxybenzoate requisite for the development of a comparable effect in *A. niger* is of the order of 300×10^{-6} and for complete fungistasis $3{,}000 \times 10^{-6}$.

SANCHEZ (G.), BOYER (F.), GRUMBACH (F.), & LAMENSANS (A.). **Production de pénicilline par culture d'un Penicillium chrysogenum, sur des milieux à base de lacto-sérum.** [Production of penicillin by culture of a *Penicillium chrysogenum* on media with a lacto-serum base.]—*Ann. Inst. Pasteur*, lxxiii, 6, pp. 612–616, 3 graphs, 1947.

High yields of an active penicillin have been obtained by the culture of a strain of *Penicillium chrysogenum* (352–17) on media with a base of lacto-serum, a little-used and inexpensive by-product of cheese manufacture.

SEIGNEURIN (R.) & ROUX (A.). **Substances antibiotiques élaborées par certains champignons supérieurs.** [Antibiotic substances synthesized by certain higher fungi.]—*Ann. Inst. Pasteur*, lxxiii, 6, pp. 595–597, 1947.

Besides verifying the remarkable bacteriostatic activity of clitocybin, the antibiotic substance secreted by *Clitocybe candida*, already reported by Hollande [*R.A.M.*, xxv, p. 309], the writers have discovered the existence of a similar property in *Tricholoma georgii*. The zones of inhibition formed round cultures of *Staphylococcus aureus* and Eberth's bacillus [*Eberthella typhosa*] after 48 hours at 37° C. measured 15 to 19 mm. in diameter, respectively, for *C. candida*, and 13 and 9, respectively, for *T. georgii*, compared with 40 and 27, respectively, for a solution of 12,500 Oxford units of penicillin per c.c.

MELIN (E.), WIKÉN (T.), & ÖBLOM (KARIN). **Antibiotic agents in the substrates from cultures of the genus Marasmius.**—*Nature, Lond.*, clix, 4051, pp. 840–841, 1947.

In the course of investigations now proceeding at the University of Uppsala, Sweden, on the production of antibiotic substances by Hymenomycetes [*R.A.M.*, xxvi, p. 350], it was found that the metabolic products of *Marasmius graminum* and *M. ramealis* [ibid., xxiv, p. 472] on a number of synthetic media exerted a marked inhibitory effect on the growth of *Staphylococcus aureus*. *M. foetidus* and *M. scorodonius* were also highly antagonistic to the test organism, whereas three other species were virtually inactive.

DOMINIK (T.) & JAGODZIŃSKI (S.). **Badania nad mykorhiza niektórych drzew owocowych w ogrodach Kórnickich.** [Researches on the mycorrhiza of some fruit trees in the Kórnik Gardens.]—*Pam. Zabl. Bad. Drzew Lasu Kórniku* [*Mem. Trees For. Res. Inst., Kórnik*], i, pp. 48–73, 10 figs., 1946. [English summary. Received July, 1947.]

The roots of the following species, growing in the Kórnik Gardens and Arboretum, Poland, were sectioned, stained, and examined microscopically: apricot, damson, cherry, almond, plum, quince, apple, walnut, black currant, gooseberry, *Pyrus calleryana*, *P. phaeocarpa*, *P. salicifolia*, *Malus rivularis* [*M. fusca*], *M. purpurea*, *Prunus serotina*, *Sorbus latifolia*, and lime (*Tilia platyphyllos*). All had endotrophic mycorrhiza except *P. serotina* and lime which had ectotrophic mycorrhiza. Damson had ecto-, endo-, and pseudomycorrhiza. The only mycorrhizal organism identified was a species of *Actinomyces* in quince.

The soil of the Kórnik Gardens is sandy, and contains less than 1 per cent. humus and only 0·03 to 0·07 per cent. total nitrogen; the pH of the surface layers is 5 to 6·5. As the minimum nitrogen content for agricultural purposes is 0·02 per cent. the greater part of the nitrogen assimilation must be performed by the fungi in the mycorrhiza. By digesting the mycorrhizal fungi the plant obtains the necessary nitrogen. In manuring tests in orchards it should be remembered that mycorrhiza grow well in acid soils and that organic or ammonia nitrogen is more advantageous to them than nitrate nitrogen. It is considered that the disturbances of symbiotic relations caused by the disappearance of the mycorrhizal fungi or the injury to them arising from improper manuring may be one of the factors causing 'fatigue of the soil'. It is important to identify the species of fungi entering into combination with fruit trees in their natural habitats and to find the soil pH which offers the best conditions for producing and developing mycorrhiza. Only then can manuring tests, supplying combinations which are most easily assimilated by fungi, be undertaken.

Hoyman (W. G.), Munro (J. A.), & Post (R. L.). **Potato fungicide experiments in 1946.**—*Bull. N. Dak. agric. Exp. Sta.*, ix, 3, pp. 85–87, 1947.

The spraying experiments described in this bulletin were designed to determine the effectiveness of some of the newer fungicides in preventing potato early blight (*Alternaria solani*) and late blight (*Phytophthora infestans*). Neither disease appeared, but the results showed that no significant difference existed between potato yields grown on plots which received both a fungicide and DDT and those receiving DDT only. The highest yields were obtained on plots sprayed with zinc-containing fungicides. Six applications of Bordeaux mixture had no apparent effect in reducing the yield.

Main (A. D. C.) & Grainger (J.). **Potato haulm burning with sodium chlorate.**—*Scot. J. Agric.*, xxvii, 1, pp. 14–17, 1947.

Since 1937 sodium chlorate has been employed successfully in Scotland for killing potato haulms [*R.A.M.*, xxv, p. 574] in the control of blight (*Phytophthora infestans*). For spraying one acre of potatoes 12 lb. in 100 gals. water is sufficient, and used at this strength has no deleterious effect upon succeeding crops. Both 1·2 per cent. sodium chlorate and 10 per cent. sulphuric acid applied at the same rate of 100 gals. per acre killed 99 per cent. of the leaves in experiments carried out in 1945 at Auchincruive. Sulphuric acid killed 90 per cent. of the stems and sodium chlorate 80 per cent. Stems killed by the latter tended to remain erect, an advantage where the crop has to be lifted by an elevator digger. Tubers can be lifted 14 days after complete killing, which takes about six days. Sodium chlorate can be applied in a slight drizzle if the amount used per acre is increased by 2 lb., but not in actual rain, whereas sulphuric acid is effective even when applied in moderate rain.

Sodium chlorate is also useful for controlling tuber size in 'seed' crops. As a haulm-destructive spray it should be applied when the number of tubers of seed size is at its maximum. A crop of Arran Pilot treated with a combined copper-containing spray and sodium chlorate yielded 8 tons of seed per acre, with only 2 tons of ware and 10 cwt. of thirds. The tubers had an over-all blight content of less than 0·1 per cent. while unsprayed crops in the neighbourhood had as much as 30 per cent.

The costs per acre are: 12 lb. sodium chlorate 6*s.*; and sulphuric acid, minimum amount 1 carboy, 9*s.*; compared with 10 gals. T.A.C.36c [ibid., xxiv, p. 429] £2.

Details are given of the most convenient and efficient spraying apparatus, by means of which two men can spray 200 acres in 56 hours. Sodium chlorate, though non-corrosive, is inflammable. Workers should avoid getting the solution on their clothes, which would be liable to catch fire when dried.

CHORIN (MATILDA). **The powdery mildews of Potatoes in Palestine.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 259–261, 2 figs., 1946. [Hebrew summary.]

Reference has already been made to the powdery mildew of potatoes caused by a species of *Oidium* in Palestine [*R.A.M.*, xxiv, p. 203], where the disease is now widespread and at times destructive. Another type of powdery mildew, occurring either jointly with the *Oidium* or independently, is due to a species of *Oidiopsis* first observed in 1941 and so far confined to the eastern Valley of Esdraelon and the north end of the Dead Sea. The fungus forms a greyish covering over the veins on the lower surfaces of the leaves. The veins, and sometimes the interveinal tissue, turn brown in isolated, later coalescent, spots. On the upper surface appears a yellow lesion corresponding with the greyish areas on the lower surface. The spots ultimately shrivel. The main difference between the symptoms of the two powdery mildews consists in the preliminary browning of the leaf stalks and veins by the *Oidium*, followed by a whitish, coherent covering of both leaf surfaces in contrast to the discrete spots and greyish coating of the under surface associated with *Oidiopsis*.

LITTAUER (F.), PALTI (J.), & MOELLER (S.). **Potato blight control in Palestine.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 186–201, 3 figs., 1946. [Hebrew summary.]

The occurrence of potato blight (*Phytophthora infestans*) in Palestine [*R.A.M.*, xvi, p. 629] is sporadic, the disease being entirely absent in some years and destructive in others. Severe tuber infection has hitherto been confined to autumn-sown stands and may or may not be preceded by a visible attack on the haulms. During the winter and early spring the disease may be found all along the coastal plain, in the Esdraelon and Jordan Valleys, and in Upper and Lower Galilee, whereas late spring and early summer outbreaks are usually restricted to parts of the coastal plain, particularly northern Sharon between Tel Aviv and Hadera, where morning mists are common. The presence of the pathogen on tubers of local origin was first established in 1942–3. Of the varieties principally grown in the country, Up-to-Date and Epicure are highly susceptible, while Arran Banner, Kerr's Pink, and Doon Star are more resistant.

The disease was effectively controlled in two trials in 1943 by spraying with 1 per cent. Bordeaux mixture or $\frac{1}{3}$ per cent. perenox, and in one test with 2 per cent. floridan [ibid., xxiv, p. 198], a proprietary preparation containing about 8 per cent. copper in ammoniacal solution, with an alkaline reaction. Adequate control increased yields and improved the grade of the crop, thereby raising its market value by 25 to 30 per cent. in one experiment.

Early blight (*Alternaria solani*) is very widespread on potato foliage throughout Palestine [loc. cit.], but usually develops late in the growing season. Tuber infection has so far been uncommon. In five experiments from 1941 to 1943, Bordeaux mixture, perenox, and floridan at the above-mentioned concentrations were of about equal efficacy in the reduction of infection. Heavy overhead irrigations with floridan (at two to three times the normal dosage) arrested the spread of the disease. Spraying did not increase the yield in this series of tests and would appear to be profitable only where the crop is attacked at an earlier stage of growth. Slight yield decreases on sprayed plots in which neither early nor late blight developed indicated a limited phytotoxic action.

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Hildebrandt (A. C.), Riker (A. J.), & Duggar (B. M.). **The influence of the composition of the medium on growth in vitro of excised Tobacco and Sunflower tissue cultures.**—*Amer. J. Bot.*, xxxiii, 7, pp. 591–597, 3 figs., 1946.

After stating that in their earlier work on crown gall [*Bacterium tumefaciens*] metabolites [cf. *R.A.M.*, xxvi, p. 238] certain extracts were found to stimulate the growth of plant tissues in cultures, the authors describe investigations in which the growth of over 8,000 tissue cultures each of tobacco and sunflower in the first passage was examined in 108 different media, with increasing and decreasing concentrations of the constituents of the basal medium, plus ferric tartrate, pyridoxine, and nicotinic acid. Formulae of improved media for tobacco and sunflower tissue cultures are given.

Hendrickx (L.). **Le mildiou de la Pomme de terre au Congo belge.** [Potato late blight in the Belgian Congo.]—*Bull. Inst. colon. belge*, xvii, 3, pp. 996–1005, 1946.

The appearance of potato late blight (*Phytophthora infestans*) in the Belgian Congo in 1942 [*R.A.M.*, xxvi, p. 235] is attributed to spread from Kenya [ibid., xxvi, p. 234], whence the disease rapidly passed to all the highland regions of central Africa where the crop is grown, i.e., Tanganyika Territory, Uganda, and the eastern part of the Belgian Congo.

The potato is a recent introduction to the Congo, and its cultivation on a commercial scale is confined to the eastern area and to places at high altitudes, such as Thysville. The appearance of *P. infestans* immediately caused great damage, since the plants, grown from tubers and seed of widely different origin, were a very heterogeneous population. The fact that the potato was present in a semi-wild state, e.g., in coffee plantations, in many localities greatly facilitated spread. The disease swept across the country in 1942–3, when no resistant planting material could be obtained from Belgium. In the hilly parts of Kivu, although plant growth slows down considerably in the dry season from May to September, the disease never disappears, since it finds conditions that maintain it in an endemic state in the low-lying areas and swamps.

Directly the disease appeared temporary measures, such as spraying and planting tubers during the dry season in land that could easily be irrigated, were recommended, but such measures cannot be applied by the natives. Further, the use of Bordeaux mixture did not always give satisfactory results, probably because it was applied too late. The only suitable method of control locally is the use of resistant varieties.

Work was at once begun at Mulungu. A collection of almost every potato variety grown in the Congo and tubers from any plant that appeared to have shown resistance were used for resistance trials in 1943, 1944, and 1945, none of which except (?) Skerry Blue [loc. cit.] gave satisfactory results. On the whole, early varieties were better than late. Varieties that flowered easily were highly susceptible.

In January, 1945, the author obtained through Nattrass [loc. cit.] two tubers of *Solanum demissum* and hybrids 759, 834, 835, 836, and 914 of *S. tuberosum* and *S. demissum*, and the Mulungu Station received a few tubers of the following clones: Salaman 1, 2, 3, Salaman-Clark 1, 2, 3, 4, and Dutch Robijn. Except for the last named and hybrid 759 all these varieties showed resistance, but were very susceptible to *Alternaria solani*. In 1946 the resistant selections were grown for tuber supply and on 6th June the disease appeared. *S. demissum* plants in the immediate vicinity remained unaffected. It seems that a new physiological form of the fungus has developed by mutation, which was able to infect the hybrids but not the parent *S. demissum*. Crosses with another clone of *S. demissum* will have to be made.

Motte (J.). **Mycopathologie d'Oryza sativa. 1. La piriculariose.** [Mycopathology of *Oryza sativa*. 1. Piriculariosis.]—*Rev. Mycologie, Suppl. colon.*, xi, 1, pp. 3–20, 2 figs., 1 map, 1946.

This account, based chiefly on the literature, of *Piricularia oryzae* on rice [*R.A.M.*, xxiv, p. 128; xxvi, p. 315] includes a definition of the disease, its common names, physiological races [ibid., xv, p. 740], and nature of the damage on various parts of the plant. Some account is given of the progress of the disease, the methods of infection, and the entry of the parasite and secondary invaders. The relative influence of external conditions is discussed, and accessory gramineous hosts are listed. Treatment of the disease, the nature of resistance, and the geographical distribution are briefly reviewed. A comprehensive bibliography is appended.

Moreau (C.). **La maladie du 'gigantisme' du Riz au Cameroun.** [The Rice disease 'gigantism' in the Cameroons.]—*Rev. Mycologie, Suppl. colon.*, xi, 1, pp. 30–31, 1946.

Specimens of rice from the Cameroons infected with *Gibberella fujikuroi* [*R.A.M.*, xxv, p. 357] have been received by the author. This is the first record of *G. fujikuroi* in the territory [ibid., xxvi, p. 32].

Depoerk (R.). **Sur un nouveau procédé de lutte contre les pourridiés en hévéaculture.** [On a new method for the control of root rots of *Hevea*.]—*Bull. Inst. colon. belge*, xvii, 3, pp. 980–986, 1946.

Heavy losses are caused to *Hevea* rubber in the Belgian Congo by root rots due to *Fomes lignosus* and *Ganoderma pseudoferreum* [*R.A.M.*, xxv, pp. 28, 358], while *Armillaria mellea* [ibid., iii, 509] is very harmful as a wound parasite. In some plantations near Stanleyville, established between 1922 and 1924, only a few survivors remain, while in others, hardly more than ten years old, already there is 35 to 50 per cent. loss. Against these rots the author recommends the sanitary measures employed in Malaya [ibid., xii, p. 54; xvii, p. 62] but with certain modifications suggested by African conditions.

Powdered copper sulphate crystals are used at the rate of 100 gm. per tree, transport of water to make solutions being too difficult and expensive locally. The crystals are ground up with three times their weight of earth and the mixture sprinkled on the excavated area. Rain acts as a diluent and with percolation the solution formed creates a more or less sterile cylinder of soil round the tap-root. Tests are in progress with other fungicides and also to ascertain whether the fungicide can, in fact, be dispensed with altogether. Roots carrying superficial mycelium are not treated with copper sulphate; scraping and laying bare are considered sufficient. The collar and upper part of the lateral roots are left bare permanently, the author having obtained convincing evidence that roots exposed to the light

remain free from decay. Leaving the holes open also reduces labour costs and the risk of mechanical injury and consequent attack by *A. mellea*.

Potentially contagious stumps bearing sporophores are not uprooted, as they are far too numerous (about 100 per ha.) but all organic debris that can spread infection is removed.

Trees the tap-roots of which show only a small area of infection (not more than one-third the circumference) are not removed, the diseased area being cut out and the wound disinfected with powdered copper sulphate.

While it is as yet too early to say that these methods have completely justified themselves, they have already quite definitely arrested the spread of the disease in young rubber plantations.

Wallace (T.). **Recent developments in methods of diagnosing mineral deficiencies of crops.**—*J.R. agric. Soc.*, cvii, pp. 122–133, 2 pl., 1 diag., 1946.

Reviewing recent developments in methods of diagnosing mineral deficiencies in crops [*R.A.M.*, xxiv, pp. 287, 337; xxv, p. 197; xxvi, p. 353] the author concludes that, in the hands of trained specialists, these methods provide the means of detecting deficiency of any mineral element at present known to be essential to crop nutrition.

Practical soil sterilization with special reference to glasshouse crops.—*Bull. Minist. Agric., Lond.*, 22, iv+22 pp., 11 figs., 3 diags., 1947. 1*s.* 3*d.*

The fourth edition [cf. *R.A.M.*, xxi, p. 97] of this bulletin with the same title has been prepared by a committee under the chairmanship of Dr. W. F. Bewley. New matter includes the 'Cheshunt' and 'John Innes' methods of sterilizing small quantities of soil by steaming. A method of sterilizing by electricity is also described together with general instructions for sterilizing with chemicals.

Middleton (J. T.). **Root rot of condiment Sage.**—Abs. in *Phytopathology*, xxxvii, 5, p. 363, 1947.

A sage (*Salvia officinalis*) planting grown for seed in the Imperial Valley of California contained stunted, wilted plants with ashen-green leaves, discoloured fibrous roots with a water-soaked, flaccid cortex, and longitudinal, sunken, dark brown to black lesions on the longer primary and secondary roots, often girdling them. Infection usually proceeds upwards for 2 to 4 in. above soil-level, causing cortical necrosis and discoloration of the exterior of the stem stele. The disease is most in evidence in poorly drained, low-lying sites with stagnant irrigation water. Isolations from infected material collected in February, 1946, yielded *Phytophthora parasitica*, which also developed, together with *Pythium aphanidermatum*, in the March samples, while the latter only was present in those of May. Both fungi, singly and jointly, induced the typical symptoms of the disease on inoculation into sage plants.

Crandall (B. S.). **A new Phytophthora causing root and collar rot of Cinchona in Peru.**—*Mycologia*, xxxix, 2, pp. 218–223, 1947.

A virulently pathogenic *Phytophthora* named *P. quininea* n.sp., causing root and collar rot and often top die-back of *Cinchona* trees and seedlings, has been reported from two localities in the upper Ucayali River basin in Peru [*R.A.M.*, xxiv, p. 289]. In *C. officinalis* and *C. succirubra* the first symptom is a reddish tint of the leaves followed by wilt and leaf-fall. In the collar region a swelling appears above the invaded tissue. Internally the invasion is marked by reddish-brown wedge-shaped areas. The pathogenicity has been proved by inoculation into Ledger form *C. officinalis* and *C. succirubra* trees. *C. calisaya* and *C. micrantha* are also susceptible to the disease. *P. quininea* is described as having hyphae 3·7 to 8 μ, but mostly 8 μ in diameter. Vegetative growth is luxuriant and cotton-like on oatmeal agar.

The sporangia, formed prolifically in running brook water, are non-papillate, ovate to obpyriform, widest near the base, and 45·9 to 67·5 by 25·5 to 37·5 μ, germinating in water, usually by discharge of 14 to 20 globose to ellipsoidal zoospores 8 to 10 μ in diameter. The simple sporangiophores are up to 75 μ long and the sporangia proliferate internally. Abundant spherical, dark brown, terminal and intercalary chlamydospores 45 to 90 μ and abundant irregular vesicles are produced. The subspherical to spherical, hyaline to faint yellow, smooth oogonia are 67·5 to 82·5 μ in diameter; the oospores are spherical, hyaline to faint yellow, granular, and 48·7 to 63·7 μ; the antheridia paragynous and irregular.

The species resembles *P. cambivora* and *P. cinnamomi* in the production of chlamydospore-like vesicles but they are not in grape-like clusters as in *P. cinnamomi*. It differs from all the non-papillate types except *P. megasperma* in producing large oogonia with paragynous antheridia. It differs from *P. cinchonae* in that the latter has smaller sporangia with flattened papillae produced both terminally and laterally on short sporangiophores, and has no chlamydospores or oogonia. *P. cinchonae* also has a lower minimum growth temperature (10° C.) and a higher optimum (30°). *P. quininea* grows best on maize meal agar at pH 6, the optimum temperature being 25° and the range 15° to 30°.

KEYWORTH (W. G.). **Verticillium wilt of Hops. A review of research to 1946.**—*Brew. Tr. Rev.*, lxi, 729, pp. 100–103, 3 figs., 1947.

The writer briefly reviews the history of research on the hop wilt caused by *Verticillium albo-atrum* from the time of its discovery by R. V. Harris [*R.A.M.*, vi, p. 579] until 1946 [ibid., xxv, pp. 140, 141]. The present position with regard to control is that the planting of resistant varieties, e.g., OR 55 and OJ 47 [ibid., xxiv., p. 205], still offers the best prospect of speedy elimination of the disease, but other possibilities are under investigation.

KARLING (J. S.). **Brazilian Chytrids. X. New species with sunken opercula.**—*Mycologia*, xxxix, 1, pp. 56–70, 56 figs., 1947.

Continuing his studies on Brazilian chytrids [*R.A.M.*, xxv, p. 475], the author describes three new saprophytic species, *Karlingia granulata*, *K. spinosa*, and *K. hyalina*, isolated from soil samples collected in the Amazon Valley. *K. rosea* [ibid., xxiv, p. 35] was found in all soil samples examined from Brazil.

KUHNHOLTZ-LORDAT (G.). **Les Urédinées corbiculées** [Corbiculate Uredinales.]—Reprinted from *Bull. Acad. Montpellier*, 2 pp., 1941. [Received July, 1947.]

The author has presented this note in an attempt to clear up the confusion relating to the paraphyses of the Uredinales and to correct the erroneous interpretation of paraphysate teleutosori. In the uredosori the paraphyses are hyaline and thin-walled, and their shape varies with the species. They are usually intimately mingled with the uredospores, but in some cases they form a true concave crown enclosing the entire sorus (e.g., *Puccinia sonchi*). In the teleutosori the organs commonly called paraphyses are brown and thick-walled; only the dimensions and degree of differentiation vary with the species. They are always arranged at the periphery of the sorus, are closely welded together and strongly concave and rigid. Usually they are united to the inner walls of the epidermal cells which persist (covered sorus). They are true corbiculae [see next abstract]. Error of interpretation arises from the fact that these brown corbiculae can become united, with the result that when a transverse section is made, the welded edges look like brown paraphyses arising from among teleutospores.

The author considers that the corbicula is a highly differentiated apparatus of a significance entirely different from that of the paraphyses and can be interpreted as a protective apparatus for the teleutospores. Together with the persistent

epidermis of the host they form what is really a little box. When the leaves, which are often packed with them, are shed the sorus is able to resist microbic disaggregation. This entails late germination of the teleutospores, in contrast to the immediate germination of unprotected teleutospores (e.g., *P. arenariae* on *Melandrynum pratense*). The term 'paraphyses' should be confined to the sterile hyaline organs of the hymenium.

KUHNHOLTZ-LORDAT (G.). **Essai de biologie des sores du diplonte chez les Urédinées.** [An essay on the biology of the sori of the diplont in the Uredinales.]—*Bull. Soc. mycol. Fr.*, lix, pp. 78–155, 40 figs., 1944. [Received July, 1947.]

The author analyses in detail the development, structure, function, and dehiscence of the uredo- and teleutosori, and the spore dissemination of the Uredinales, with precise definitions of the terms used. The sorus of the diplont when highly differentiated consists of a stroma, a sporogenous mat which produces the spores and paraphyses, a 'corbicula' (corbeille) [see preceding abstract], and the teguments of the [host] matrix, which afford protection to sporogenesis.

The paraphyses are related to the function of the uredosorus which is essentially the dissemination of the multiplicative phase (uredospores); the 'corbicula' is connected with the function of the teleutosorus, namely, the dissemination of the resting spores.

Highly differentiated corbiculae are found in the different families of the Uredinales. Rigid corbiculae, often incurved as a cover over the stroma, induce marked modifications in the spores, which become deformed ('baroques'), but may remain unicellular (mesospores); beneath the median part of the sorus, the pressure being less, the spores are normal (symmetrical).

In considering the systematics of Uredinales some account should be taken of the structure of the sori. Biometrical criteria are apt to be unreliable; the peduncles measured during the retarded stage of teleutosorus development may be shorter than at the moment of dissemination. The brachysporous and dolichosporous forms may vary in number both in time and space. Before attempting to establish systematic affinities by means of measurements the sori should be compared as completely as possible. New possibilities of classification exist in the study of the stromata.

KUHNHOLTZ-LORDAT (G.). **Sur un mode de formation des 'conidies' d'Urédinées (rouille du Mahonia).** [On a mode of formation of the 'conidia' of Uredinales (*Mahonia* rust).]—*Bull. Soc. mycol. Fr.*, lx, pp. 47–51, 8 figs., 1944. [Received July, 1947.]

The barberry rust [*Cumminsiella sanguinea*: *R.A.M.*, xiii, p. 185] has a very complex apparatus for uredospore emission consisting of a small aseptate column, which as it grows emits from the apex uredospores and produces numerous non-deciduous paraphyses in which the column remains enveloped along its entire length. The column itself is comparable to a conidiophore. The term 'uredospore' therefore seems open to criticism from several points of view, particularly the absence of chromosome reduction, and should be replaced by 'uredoconidium'.

The systematic position of the rust has been much discussed. The present tendency appears to be against separating it from *Puccinia*, this genus being taken to include all species with two-celled teleutospores. The author considers, however, that the shape and manner of formation of the uredospores and the special nature of the teleutospore wall justify the splitting up of the genus. The justification for having the genus *Tranzschelia*, for example, lies much more in the mode of reproduction of the diplont than in the form of the teleutospores, e.g., *P. prunispinosae*. Those who admit as much will find equally good reasons for abandoning Peck's binomial, *P. mirabilissima*, for the barberry rust. The author considers that the

structure of the sori is of more systematic importance than the morphology of the spores [see preceding abstracts].

In a footnote it is stated that the rust is spreading in the vicinity of Montpellier. Locally, teleutospores are uncommon, though some were found in the uredosori about the middle of April; [uredo]conidia are emitted throughout the year.

SĂVULESCU (T.). **Matériaux pour la flore des Urédineés de Roumanie. Supplément.** [Materials for the flora of the Uredinales of Rumania. Supplement.]—*Bull. Sect. sci. Acad. roum.*, xxvi, 5, pp. 308–332, 2 figs., 1944. [Received 1947.]

This further contribution to the author's studies on Rumanian rusts [*R.A.M.*, xxvi, p. 316] brings the total number of species known to occur in the country to 367 and the number of hosts to 697. Among the ten species and three forms new to Rumania is *Puccinia coronata* f. sp. *alopecuri* and f. sp. *agrostis*.

THIRUMALACHAR (M. J.). **Some noteworthy rusts. II.**—*Mycologia*, xxxix, 2, pp. 231–248, 18 figs., 1947.

A description is given of a second collection of rusts from south India [cf. *R.A.M.*, xxv, p. 11; xxvi, p. 266]. Those reported on the leaves of hosts of economic importance are *Puccinia exhauriens* on *Jasminum* sp., *P. phyllocladiae* on *Asparagus* sp., *Uredo celastri* on *Celastrus paniculata*, and *Mainsia pterocarpi* n.sp. on *Pterocarpus marsupium*, an important timber tree in the forests of Mysore, which sometimes suffers severe defoliation from the rust. The uredosori are hypophyllous on indistinct infection spots. The subglobose to spherical, pale yellow uredospores are borne singly on pedicels, and are 12·5 to 15 by 10 to 12·5 μ. The teleutosori are minute, and the teleutospores hyaline, unicellular, and pedicellate with four to six spores in a cluster on a sporogenous basal cell. They are clavate to cylindric, broader at the apex, rounded, and 21 to 30 by 10 to 12·5 μ; the epispore is thin, hyaline, and smooth.

KERN (F. D.) & WEST (E.). **Another Gymnosporangial connection.**—*Mycologia*, xxxix, 1, pp. 120–125, 1 plate, 1947.

The authors report the discovery of the perfect state of *Roestelia hyalina* in a new *Gymnosporangium* on *Chamaecyparis thyoides* collected near Bristol, Florida, and in South Carolina. *Chamaecyparis* grows in all the parts of North and South Carolina and Florida where *R. hyalina* occurs on *Crataegus* spp. Cultures from both the Florida and South Carolina specimens inoculated on a *Crataegus* sp. in the greenhouse in Pennsylvania gave *R. hyalina*. Cultures from the Florida specimens gave similar results on *C. rimosiformis* and *C. uniflora* at Gainesville, Florida.

The combination *G. hyalinum* was used hypothetically in 1911 for the presumed perfect state of *R. hyalina*, and a description is now supplied which makes the name valid. The pycnidia are epiphyllous. The hypophyllous aecidia, occurring on small, pyriform, gall-like protuberances, are consolidated at the bases, cylindric, 2 to 5 mm. high, tardily rupturing along the sides, somewhat distorted but not recurved, the peridial cells lanceolate, remaining straight when wet, the outer wall 12 to 16 μ thick, the inner and side ones 3 to 4 μ, smooth on all surfaces. The globoid, pale cinnamon-brown aecidiospores are 2 to 3 μ wide, finely verrucose, with 6 to 8 pores. The teleutosori are caulicolous, pulvinate, scattered or aggregated, varying in shape and size, 1 to 5 mm. across, light chocolate-brown; the 2-celled, ellipsoid teleutospores, slightly constricted at the septum, measure 16 to 21 by 40 to 63 μ; the golden-brown wall is 1 to 1·5 μ thick, up to 4 μ at the apex; pores one in a cell, apical; pedicels cylindrical, 3 to 5 μ in diameter, moderately long.

The aecidial stage occurs on *Crataegus* spp. and *Pyrus communis* × *P. pyrifolia*.

MOREAU (C.). **Une Sphaeropsidale nouvelle sur les gousses d'Albizzia Lebbek Benth.** [A new member of the Sphaeropsidales on the pods of *Albizzia lebbek* Benth.].—*Rev. Mycologie, Suppl. colon.*, xi, 1, p. 29, 1 fig., 1946.

On the pods of *Albizzia lebbek* [*R.A.M.*, xvi, p. 786] gathered at Dakar an abundance of round, smooth, dark brown, erumpent pycnidia was noticed; each 70 to 130 μ high and 100 to 200 μ in diameter with round stomatal openings 8 to 10 μ wide. The spores on short stalks are hyaline, biguttulate, elongate-ellipsoid or rarely ovoid, and measure 4 to 5 by 2 to 2·5 μ. The fungus has been named *Phoma albizziae* n.sp. [without a Latin diagnosis]. It is the first *Phoma* sp. to be recorded on *Albizzia*; it is similar to *P. leguminum* but is distinguished by its very small, delicate spores.

GARNER (W. W.). **The production of Tobacco.**—xiii+516 pp. 75 figs., 2 diags., 3 graphs, 1 map, Philadelphia, The Blakiston Company, 1946. $6.00.

The present volume is designed for the use of students in agricultural colleges and universities, and for agricultural workers requiring a broad background of information on the fundamentals of tobacco production. With these needs in view, the author has sought to provide a concise, reasonably comprehensive survey of the essential features of tobacco production and its problems. Chapter XIII deals with the diseases of the crop and their control and XVII with the mineral nutrition of tobacco, including various deficiency disorders.

OSTER (G.), DOTY (P.M.), & ZIMM (B. H.). **Light scattering studies of Tobacco mosaic virus.**—*J. Amer. chem. Soc.*, lxix, 5, pp. 1193–1197, 6 graphs, 1947.

Light-scattering measurements were made on a freshly prepared sample of purified tobacco mosaic virus, in which the length of the particles, determined from dissymmetry of light scattered by the solutions, was found to be 270 mμ [*R.A.M.*, xxvi, p. 268]. Application of the dissymmetry method to turbidity measurements gave a weight-average molecular weight of 40,000,000 for the particles. These values are in complete agreement with sizes determined from electron microscope and viscosity studies made on the same sample, indicating the validity of the light-scattering technique.

For dilute solutions of tobacco mosaic virus in water the dissymmetry decreases with rising virus concentration, denoting the occurrence of strong interaction with a consequent increase in order of the scattering particles. However, the dissymmetry is independent of concentration for dilute solutions of the virus in 0·1 *M* sodium phosphate buffer at pH 7.

SMITH (T. E.). **D-D mixture as a soil treatment for bacterial wilt on Tobacco.**—*Phytopathology*, xxxvii, 5, p. 371, 1947.

Applied on 8th March, 1944, to holes in the soil of plots 12 by 24 ft. with water-tight sidewalls, commercial D-D mixture, at dosages of 2, 4, and 8 ml. per sq. ft. soil surface, reduced the incidence of tobacco bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*) [*R.A.M.*, xxiii, p. 460] in a susceptible variety planted on 1st June from 82 to 59, 24, and 0 per cent., respectively. The same plots, replanted with susceptible tobacco without further treatment, showed 71, 73, and 11 per cent. wilt, respectively on 1st August, 1945, as against 83 per cent. in the controls. At the heavier rates the fumigant induced, in the 1944 crop, the foliar darkening, brittleness, and upward rolling of the margins typical of excessive chlorine.

HEUBERGER (J. W.). **Suggestions on planning Tomato disease control programs.**—*Food Packer*, xxviii, 7, pp. 59–61, 1947.

The following are some of the suggestions offered to growers and canners who

are considering a tomato disease control programme by the use of fungicides, aiming chiefly at the elimination of early and late blights [*Alternaria solani* and *Phytophthora infestans*: *R.A.M.*, xxvi, p. 269] and anthracnose [*Colletotrichum phomoides*: ibid., xxvi, p. 360]. Spraying was found to be more effective than dusting over the three-year experimental period 1944–46 in Delaware, and ground superior to aeroplane dusting. For the eastern and mid-western States the programmes recommended are (*a*) dithane Z–78 or parzate (both being brands of zinc ethylene bisdithiocarbamate), (*b*) an alternating schedule of zerlate or one of the foregoing and tribasic copper sulphate or other fixed copper compound, (*c*) zerlate for the first few treatments followed by Bordeaux or fixed copper if late blight threatens, and (*d*) various fixed coppers, e.g., copper compound A, tribasic, copper oxychloride sulphate, and yellow cuprocide. A minimum of three applications should be made, the first at 'breaking' and the second and third at approximately ten-day intervals. Attention should be paid to planting in long, narrow strips, enabling an orchard sprayer to be used, and wider spacing of the rows, setting the plants closer together.

MILLS (MARGARET M.) & HUTTON (E. M.). **Fusarium wilt of Tomato in Australia. 1. The relationship between different isolates of the pathogen and resistance in varieties of Lycopersicon esculentum Mill. and other Lycopersicon species.**— *J. Coun. sci. industr. Res. Aust.*, xix, 4, pp. 376–386, 1946.

Tomato wilt (*Fusarium bulbigenum* var. *lycopersici*) [*R.A.M.*, xxvi, pp. 83, 176] is productive of economic losses in North Queensland and the Northern Territory, and on sandy soils in South and Western Australia. In a study of susceptibility and resistance different tomato varieties from Australian and overseas sources were tested in the greenhouse against ten isolates of the fungus that had been proved to be highly pathogenic to Bonny Best. The result showed that the only highly resistant variety (no wilted plants) was Pan America. Field observations confirmed this result, no instance of infection having been found in Australia on this variety. Apart from this, one group of varieties developed about 100 per cent. severely wilted plants, a second group 60 to 90 per cent., and a third only 30 to 50 per cent. The opinion is expressed that under different environmental conditions the varietal reactions might indicate differing degrees of susceptibility in any one variety. For example, the third group contains such varieties as Break o' Day, Pearson, Rutgers, Denisonia, Riverside, and Recruit, which have shown good field resistance in Northern Territory and Queensland.

Further greenhouse inoculation tests demonstrated that the lines of *Lycopersicon pimpinellifolium* used were all highly resistant to the isolates employed. Two lines of *L. peruvianum* were, respectively, highly resistant and resistant, *L. hirsutum* was resistant, and *L. pissisi* only moderately so.

From these results it can be assumed that most lines of *L. pimpinellifolium* are highly resistant to the strains of the fungus usually found in Australia and appear to be the best source of genes conferring high resistance. As, however, Pan America evidently possesses these genes, in practical breeding work under local conditions this variety can be used as a source of resistance in crosses with susceptible varieties. That the high resistance of Pan America is transferred to the progeny of crosses with susceptible varieties is demonstrated in a subsequent paper.

When 1,200 plants of 30 different varieties were inoculated with two different isolates of the fungus (half of the plants of each variety with one isolate and half with the other), one set showed 40 per cent. non-wilted plants, the other 27 per cent., indicating a difference in pathogenicity between them. Further work using 10 isolates on 12 varieties definitely suggested that under Australian conditions strains of the wilt fungus are present that show different degrees of pathogenicity, though such differences are not substantial. These tests also showed that Pearson

29–17 (an improved selection of Pearson from California) was significantly more resistant than Pearson.

FOSTER (R. E.) & WALKER (J. C.). **Predisposition of Tomato to Fusarium wilt.**—*J. agric. Res.*, lxxiv, 5–6, pp. 165–185, 5 figs., 8 graphs, 1947.

The purpose of this investigation was to determine in what way and to what extent certain factors in the environment influence the predisposition of tomatoes to wilt (*Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici*) [*R.A.M.*, xxv, p. 478 and preceding abstract].

Three varieties were used, the very susceptible Bonny Best, the intermediate-resistant Marglobe, and the highly wilt-resistant *Lycopersicon pimpinellifolium*. They were grown free from the wilt organism for a period of from 30 to 50 days under environmental conditions which were near the optimum for vigorous growth except for the variation of a single predisposing factor. At the end of the predisposing period all plants were inoculated with a virulent strain of *F. bulbigenum* var. *lycopersici*. All the plants were then maintained as near as possible to the optimum conditions for the development of wilt. Those plants of Bonny Best and Marglobe predisposed at 28° C. soil temperature wilted most severely, those at 20° and 36° less so, and least at 12°. Bonny Best predisposed at 20° and Marglobe at 28° showed approximately the same degree of susceptibility. The two varieties were most effectively predisposed to wilt at 28° air temperature, less so at 24° and 20°, and least at 16°. Again the reactions of Bonny Best predisposed at 20° and Marglobe at 28° were similar. These results showed that temperatures most favourable to the growth of tomatoes were also most favourable to wilt, and that the effect of air temperature alone was somewhat less pronounced than that of soil temperature alone in predisposing the plants to wilt.

Predisposed at different soil moisture levels, Bonny Best and Marglobe both wilted in dry soil (15 per cent. of wet weight), whereas very wet soil (37 per cent.) decreased their potential susceptibility. Effective predisposition to wilt was achieved in both by allowing only six hours' daylight each day. Plants were grown under low or high light intensities of approximately 90 or 800 foot-candles, respectively, furnished by sunlight supplemented with artificial light. Those receiving less light were predisposed to wilt to a greater degree than those grown under light of high intensity.

Predisposition most favourable to subsequent wilt in both varieties was obtained by low nitrogen, high potassium, or low phosphorus concentration [ibid., xxv, p. 424] as compared with the balanced solution or with high nitrogen, low potassium, or high phosphorus, respectively. Decrease in potential susceptibility to wilt was found to have been conditioned in the plants by the solutions in the following order: low phosphorus (most susceptible), low nitrogen, high potassium, balanced solution, high phosphorus, low potassium, high nitrogen (least susceptible). Both Bonny Best and Marglobe grown in nutrient solutions of low pH were more susceptible, and those in high pH less susceptible than those grown in the solution at pH 6·5 to 7. Age of plant at the time of inoculation had no marked effect upon wilt development. Both Bonny Best and Marglobe are thus predisposed to wilt by the same environmental factors and apparently in the same manner. Resistant plants were made to appear susceptible, and normally susceptible ones to appear resistant by proper control over the external environment prior to inoculation. The highly resistant Red Currant tomato remained immune under all conditions.

STEVENSON (J. A.) & MCCOLLOCH (L. P.). **Myrothecium as a Tomato fruit rot organism.**—*Plant Dis. Reptr*, xxxi, 4, pp. 147–149, 1947. [Mimeographed.]

Plant quarantine inspectors have sometimes intercepted at Texas border stations

tomato fruits from Mexico with a rot due to a species of *Myrothecium* [*R.A.M.*, xxiii, p. 191]. They each bore one to several lesions which were dark brown to black, roughly circular to oval, flattened to slightly depressed, 1 to 3 cm. in diameter, somewhat zonate, especially after sporodochia formation, and sharply demarcated. The rot penetrates deeply into the fruit and forms a firm lump, which can be easily removed. The fungus produces sporodochia readily in circular bands, finally covering most of the lesions, the growth being greenish to black with a narrower band of white mycelium typical of the genus. It is easily isolated and grows and fruits on several standard media. It is a narrow-spored type and can be definitely referred to *M. roridum*. Puncture inoculations on greenhouse tomatoes at the Plant Industry Station at Beltsville produced characteristic fruiting lesions. This tomato disease seems to appear only sporadically, and little is known about the factors necessary for fruit infection in the field.

W. H. Tisdale described in 1916 a greenhouse tomato disease in Wisconsin, the so-called '*Melanconium*' ring rot [ibid., xvi, p. 70]. His description and illustrations of the causal fungus can be interpreted readily as *Myrothecium* and the conidia described by him correspond with those of *M. verrucaria*. Some of Tisdale's original preserved specimens were examined. The lesions were quite typical of those observed on the Mexican specimens, but unfortunately no conidia or other evidences of the *Melanconium* were found. Nevertheless the authors are certain that the causal agent of Tisdale's disease was a species of *Myrothecium*, apparently *M. verrucaria*.

W. L. White, reporting at the recent Boston meeting of the Mycological Society of America, pointed out that the so-called *Metarrhizium glutinosum* [ibid., xxvi, p. 163], widely used in recent years as a test organism in studies of fibre deterioration, is to all intents and purposes *Myrothecium verrucaria* [*sensu* Preston].

MOREAU (C.). **Sur le Gloeosporium kaki Seiya Ito.** [Concerning *Gloeosporium kaki* Seiya Ito.]—*Rev. Mycologie*, N.S., x, 5–6, pp. 125–127, 5 figs., 1946.

Gloeosporium kaki [*R.A.M.*, xxvi, p. 270], isolated from the fruits of *Diospyros lotus* and the shells of walnuts (*Juglans regia* and *J. nigra*) grown at Caen, has been reported previously only from Japan [ibid., xvi, p. 410] and Italy and on persimmon (*D. kaki*). The development and cultural appearance of the fungus, and conidial germination are described. The conidiophores arise either separately or massed in sporodochia.

WEISS (F.) & ST. GEORGE (R. A.). **Culture, diseases, and pests of the Box tree.**—*Fmrs' Bull. U.S. Dep. Agric.* 1855, 18 pp., 9 figs., 1 map, 1947.

This is a slightly revised version of the bulletin with the same title published in 1940 [*R.A.M.*, xx, p. 434].

CAMPBELL (W. A.). **A new species of Coniothyrium parasitic on sclerotia.**—*Mycologia*, xxxix, 2, pp. 190–195, 1 fig., 1947.

Coniothyrium minitans n.sp., parasitizing the sclerotia of *Sclerotinia sclerotiorum* on guayule [*Parthenium argentatum*] near Salinas, California [*R.A.M.*, xxvi, p. 169], and from Brussels sprouts near Carmel, has been obtained in pure culture. It is described as having superficial, globose, smooth, carbonaceous pycnidia 200 to 700 μ in diameter. The pycnidiospores exude as a black liquid mass from a central ostiole; they are brown, ellipsoid, smooth or minutely roughened with age, and 4 to 6 by 3·5 to 4 μ. They germinate readily on potato dextrose or water agar, forming a mat surface covered with dark pycnidia. The fungus grows best at 20° C. Inoculation experiments showed that suspensions of *C. minitans* readily parasitized and disintegrated sclerotia of *S. sclerotiorum* and *S. minor* which formed

a good basis for pycnidial development. In one experiment the formation of apothecia from sclerotia of *S. sclerotiorum* in sterile sand was suppressed when pycnidiospores of *C. minitans* came into direct contact with sclerotia and when they were poured on the sand. From these experiments it seems that there is a possibility of *Sclerotinia* spp. being controlled biologically by *C. minitans*.

CHORIN (MATILDA). **Downy mildew on Cauliflower curds.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 258–259, 2 figs., 1946. [Hebrew summary.]

Downy mildew of cauliflower curds (as distinct from the plants) caused by *Peronospora brassicae* [*P. parasitica*: *R.A.M.*, xxiii, p. 247] was first observed in Palestine in 1940, the localities affected including the coastal zone, western Galilee, and the Esdraelon and Jordan Valleys. The disease is particularly noticeable on heads kept on for seed production and their development is arrested. The yellowish-white spots extend some distance down into the interior of the head. Black dots and elongated depressions develop over the entire infected area. Diseased plants may be simultaneously attacked by *Xanthomonas campestris* [ibid., xxiv, p. 301] and *Alternaria*, which induce more rapid decay of the head.

HULL (R.) & WILSON (A. R.). **Distribution of violet root rot (Helicobasidium purpureum Pat.) of Sugar Beet and preliminary experiments on factors affecting the disease.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 420–433, 1 pl., 1946.

Examination of sugar beets grown in eastern England over the period 1936–43 demonstrated that up to 5 per cent. of factory tarehouse samples contained roots infected by *Helicobasidium purpureum* [*R.A.M.*, xxv, pp. 149, 203]. The evidence indicated that there are considerable areas where light attacks occur, as well as fields where severe outbreaks develop when susceptible crops are grown. The disease was most frequent on roots from light alkaline soils. It reduced the sugar content by 1 to 2 per cent. and doubled the dirt tare of the beets. Clamping a crop with a small number of diseased roots entails no spread in periods up to 2½ months; with 10 per cent. or more diseased roots severe losses may result.

Observations suggested that *H. purpureum* persists in the field on weeds. Severe outbreaks are frequently associated with weedy fields. The fungus also survives as sclerotia, which develop freely on the roots of susceptible crops. Good cultural practices, trap cropping, and the use of nitrogenous fertilizers act as a check, even when susceptible crops are grown consecutively. Wet soil conditions did not favour infection, but may, perhaps, favour sclerotial survival as the disease may occur frequently in wet places.

Experiments with compost made from factory waste showed that although *H. purpureum* can survive the process, its virulence is so reduced that the use of such compost is unlikely to cause severe infection.

Although rotation with non-susceptible crops is a measure for reducing soil infectivity this does not invariably follow and it appears that there are factors involved in cultivation practices which lead to greatly reduced infectivity even when a succession of susceptible crops is grown.

MIDDLETON (J. T.) & SNYDER (W. C.). **The production of Ascochyta-free Pea seed in southern California.**—Abs. in *Phytopathology*, xxxvii, 5, p. 363, 1947.

Pea seed free from infection by *Ascochyta* [spp.] has been produced from naturally and artificially contaminated Little Marvel, naturally infected Alaska, and inoculated No. 76 seed in the Imperial and Temecula Valleys of southern California. In the latter locality the peas were grown during the dry summer period and in the former, where the average rainfall from August to the end of December totals

1·19 in. and from November to March 1·64 in., during the winter and late spring. At no time throughout the three years covered by the investigation were aerial blight symptoms observed in any of the plantings, while plants raised from healthy seed sown in ground cropped with peas for the last 23 years showed neither below- nor above-ground infection by *A. pisi*.

LEACH (L. D.) & SNYDER (W. C.). **Localized chemical applications to the soil and their effects upon root rots of Beans and Peas.**—Abs. in *Phytopathology*, xxxvii, 5, p. 363, 1947.

Of the chemicals so far tested [? in California] for the prevention of root rot of beans [*Phaseolus vulgaris*] caused by *Rhizoctonia* [*Corticium*] *solani*, *Fusarium solani* f. *phaseoli*, and *Thielaviopsis basicola*, and peas (*C. solani*, *F. solani* f. *pisi*, and *Ascochyta* spp.), 25 per cent. dithane D14, applied to the row when sowing, has proved the most effective. Used at the rate of 1 gal. (or 2 lb. of the dry powder, dithane A10) per acre the fungicide caused substantial reductions in the incidence of the disease.

MACKIE (W. W.), SNYDER (W. C.), & SMITH (F. L.). **Production in California of Snap-Bean seed free from blight and anthracnose.**—*Bull. Calif. agric. Exp. Sta.* 689, 23 pp., 1 map, 1945. [Received July, 1947.]

In the United States the greatest losses among beans [*Phaseolus* spp.] are caused by anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, xxiv, p. 350] and bacterial blight (*Bacterium* [*Xanthomonas*] *phaseoli* [ibid., xxvi, p. 92], *Bact.* [*Pseudomonas*] *medicaginis* var. *phaseolicola* [ibid., xxvi, p. 373], and *Bact.* [*Corynebacterium*] *flaccumfaciens* [ibid., xxv, p. 89]).

As these diseases are seed-borne, attempts have been made to control them by various seed treatments, and also by the application of dusts and sprays in the field and by introducing resistant varieties [ibid., xxvi, p. 325]. All these methods, however, are ineffective in humid areas. The best control method so far has been by the use of disease-free seed [ibid., xxvi, p. 372] coupled with crop rotation. The diseases do not occur in bean-seed crops grown in California during the dry summer. The area with almost rain-free summers seems to be adequate to meet all demands of the United States for snap-bean seed free from these diseases. Other advantages of California-grown seed are the low incidence of seed-borne mosaic and of field hybridization. Bean seed grown in California is more expensive than seed from other States, but the absence of disease in the crop more than compensates the higher cost.

BARRY (J. P.). **Une grave maladie de la Fève (Botrytis fabae Sardiña).** [A serious Broad Bean disease (*Botrytis fabae* Sardiña).]—*Progr. agric. vitic.*, cxxvii, 15–16, pp. 290–291, 1947.

Attention is drawn to the symptoms and control of chocolate spot of broad beans (*Botrytis fabae*) [*R.A.M.*, xxv, p. 247; xxvi, p. 110], which is reported for the first time in France on plants from Saint-Bauzille-de-Putois.

OGILVIE (L.) & MUNRO (M[OIRA D.]). **Occurrence of Botrytis fabae Sardiña in England.**—*Nature, Lond.*, clx, 4055, p. 96, 1947.

Chocolate spot (*Botrytis fabae*) [see preceding abstract], hitherto reported only from Spain, Morocco, Cyprus, Egypt, and China, has now occurred [on broad beans] in south-west England. It is readily distinguished from *B. cinerea* on beans, common in eastern England, by its larger spores and smaller sclerotia.

BOOER (J. R.). **Further experiments on the control of white rot (Sclerotium cepivorum Berk.) in Onions, Shallots, and Leeks.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 413–419, 3 figs., 1946.

In further work on the control of *Sclerotium cepivorum* [*R.A.M.*, xxv, p. 90] in spring-sown onions, the application of 1 lb. 4 per cent. calomel [mercurous chloride] dust per 50 yds. seed drill at sowing gave adequate control in salad onions. Broadcasting 1 oz. 4 per cent. calomel dust per sq. yd. before sowing was less effective. Post-emergence application of the dust gave no control. In autumn sowings seed-drill treatment at 1 lb. per 50 yds. controlled infection the following spring but caused severe retardation and loss of crop. Onion seedlings raised in heat and dipped in an aqueous paste of calomel dust (480 gm. in 210 ml. water) before being transplanted showed high resistance to a severe outbreak, while similar treatment of shallot bulbs was also effective. In both cases the treatment substantially increased yield and to some extent reduced storage losses.

MIDDLETON (J. T.) & YARWOOD (C. E.). **Fungicidal control of Cantaloupe powdery mildew.**—*Bull. Calif. agric. Exp. Sta.* 697, 8 pp., 4 figs., 1946.

In 1938 a new biological race of melon powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xxv, p. 24] appeared in California, to which No. 45, a previously resistant cantaloupe, was highly susceptible. Since 1938 three new resistant varieties, Nos. 5, 6, and 7, have been introduced [ibid., xxiv, p. 216], but there is always the possibility that strains of the fungus will appear to which these new types are also susceptible. Fungicidal control is therefore important.

Extensive spraying and dusting experiments have been conducted on a commercial scale over a period of years in the Imperial Valley. The collective result, expressed as percentage reductions in mildew, for the different spray materials, all used with triton B–1956 spreader (6 oz.–100), were as follows: Bordeaux mixture (2–2–100) 91, bordelo (2 per cent. copper ammonium carbonate) 94, Burgundy mixture (1·5–2–100) 95, Burgundy (without spreader) 81, copper sulphate (2 oz. in 100) 68, cuprocide 95, cupro K 53, fermate 71 (all at 1·5 in 100), spergon (0·75–100) 89, spraycop (1·5–100) 72, wettable sulphur (3 in 100) 100, liquid lime-sulphur (0·1 per cent.) 60, (0·3 per cent.) 98, the latter followed by cuprocide 93, or followed by Bordeaux 94.

Wettable sulphur caused injury to the plant, as did 0·3 per cent. lime-sulphur at 95° F. and above. Burgundy is more easily applied than Bordeaux and, together with other copper sprays, is thought to be as good as cuprocide for the second application. Cuprocide has been used successfully on a large scale by the growers. For early plantings 0·3 per cent. lime-sulphur followed by cuprocide is recommended for general use. For medium and late plantings one application of a copper spray will usually be sufficient. The first spray should be applied when one to five mildew spots per leaf are found on the lower surfaces of the crown leaves. The second should follow when mildew again increases to the same degree of severity.

DUVDEVANI (S.), REICHERT (I.), & PALTI (J.). **The development of downy and powdery mildew of Cucumbers as related to dew and other environmental factors.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 127–151, 2 figs., 1 diag., 1946. [Hebrew summary.]

The effect of the presence or absence of dew on the development of cucumber downy mildew (*Pseudoperonospora cubensis*) was studied on the Beit Alfa variety at the Pardess Hanna Agricultural School, Karkur, in the northern part of the Palestine coastal plain [*R.A.M.*, xxvi, p. 180], on small plots, some of which were protected from dew formation by the nightly application from sunset to sunrise, between 17th June and 4th September, 1942, of canvas canopies. Most of the plots

were irrigated by furrows, but overhead pipes were used on others. Some observations on powdery mildew (*Erysiphe cichoracearum*) [loc. cit.] were included in the investigations.

Prevention of dew formation largely inhibited the development of downy mildew between 9th and 31st July, especially on the furrow-irrigated plots, on which the incidence of foliar infection was reduced from 62 to 31 per cent., the corresponding figures for the overhead series being 63 and 54 per cent. respectively. The exclusion of dew failed to prevent powdery mildew development.

The analysis of daily meteorological records in relation to observations on the appearance and spread of *P. cubensis* in the Palestine coastal plain led to the following conclusions. Cucumber leaves are liable to infection only when dew intensity reaches the level expressed by 2 to 2–3 in the Duvdevani dew scale ('Dew in relation to plants'. In preparation). During the ten-hour nights of June and July downy mildew will develop only when the nightly minima are not below 18° C. at a height of 15 cm. in the open. In the 12-hour September nights, however, infection may take place at a minimum of 16°, while at 18° the fungus spreads very rapidly. The incubation period of cucumber downy mildew was eight to ten days in June and July, and four to five in September.

Reichert (I.), Palti (J.), & Moeller (S.). **Field trials for the control of downy and powdery mildew of Cucumbers. II. The comparative efficacy of copper and sulphur fungicides.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 214–229, 1 fig., 1946. [Hebrew summary.]

In continuation of previous experiments on the control of cucumber downy and powdery mildews (*Pseudoperonospora cubensis* and *Erysiphe cichoracearum*) [*R.A.M.*, xxiv, p. 263], 13 field trials were conducted in different parts of Palestine from 1942 to 1944, mostly on furrow-irrigated plots. Dusting with various brands of sulphur gave excellent control of *P. cubensis*, against which spraying with 1·5 per cent. lime-sulphur was partially effective. *E. cichoracearum* was also amenable to the sulphur dusts, which further materially reduced the aphid population, did not seriously injure the foliage, and extended the picking season. These preparations increased the yield by up to 60 or 70 per cent. in some of the experiments, the actual gain in weight in one test amounting to 2·4 tons per 1,000 sq. m. Treatments with weak copper sprays, e.g., 0·75 per cent. Bordeaux mixture, 0·25 per cent. perenox, and 1 to 1·5 per cent. floridan, effectively combated downy mildew, but did not give such heavy yield increases as sulphur-dusting.

In the few tests carried out under overhead irrigation neither the sulphur nor the copper-containing fungicides conferred adequate protection against severe attacks of *P. cubensis*: in milder outbreaks the copper sprays were more profitable than the sulphur. Since overhead irrigation favours downy mildew development [see preceding abstract], cucumbers should be grown in furrow-irrigated plots wherever the disease tends to be serious.

Takahashi (W. N.) & Rawlins (T. E.). **An electron microscope study of Squash mosaic virus.**—*Amer. J. Bot.*, xxxiv, 5, pp. 271–272, 1 fig., 1947.

Examination of juice of Zucchini squash plants, infected with the squash mosaic virus [cucumber mosaic virus: *R.A.M.*, xxiii, p. 424], by means of the electron microscope showed that the virus consists of spherical particles with an average diameter of 30 mμ.

Raychaudhuri (S. P.). **A mosaic disease of Brinjal (Solanum melongena Linn.).**—*Curr. Sci.*, xvi, 5, pp. 149–150, 3 figs., 1947.

A mosaic disease of brinjal [eggplant] was rather widespread in 1946 at Delhi. The affected plants showed bright green mosaic mottling and puckering and

crinkling of the leaf. Occasionally fine, pale straw-coloured, concentric, irregularly shaped rings developed on the leaf. In some cases the midrib or its branches extended beyond the lamina, while in others the leaf was completely changed into a filamentous structure. The development of flowers and fruits was greatly reduced. The disease was transmitted by grafting to healthy eggplant, tomato, and tobacco plants raised in an insect-proof house.

Myzus persicae and *Empoasca devastans*, observed on diseased eggplants, were transferred directly to healthy eggplant, potato, tomato, and tobacco plants raised in the insect-proof house. All the eggplants and tomato plants on which *E. devastans* were set free showed typical symptoms of the disease in 24 to 37 days, while potato and tobacco and all four hosts on which *M. persicae* were liberated remained healthy.

The symptoms of this eggplant disease differ from those of the virus diseases of eggplants in Rumania [*R.A.M.*, xiv, p. 215; xvii, p. 581]. Further work is in progress.

PEKLO (J.). **Plodnice jedlé houby v čisté kultuře.** [The fruiting body of an edible fungus in pure culture.]—*Čas. čsl. Houb.* [*J. Czech Mycol.*], xxi, 1 p., 1 fig., 1941. [Received May, 1947.]

The author isolated one of the Clavariaceae (? *Sparassis crispa*) from a rotten pine root. The fruiting bodies were easily produced on malt agar in pure culture. The fructifications were of good flavour, and the author suggests experiments to explore the possibility of growing the fungus for food.

CAPOOR (S. P.), VARMA (P. M.), & UPPAL (B. N.). **A mosaic disease of Vigna catjang Walp.**—*Curr. Sci.*, xvi, 5, p. 151, 1 fig., 1947.

In October 1942 some plants of *Vigna catjang* [*V. unguiculata*: cowpea] growing on the Agricultural College Farm, Poona, showed mosaic symptoms [*R.A.M.*, xxi, p. 514]. The leaves were malformed and dwarfed, dark green areas being interspersed with light green. At a later stage the chlorosis became severe with small green areas dispersed over the surface. The affected plants bore only a few small pods, with broad, light and dark green stripes on their surfaces and containing a few seeds each.

The virus is sap-transmissible and infection is rendered much easier by the addition of 600-mesh carborundum to the inoculum. *Aphis medicaginis* transmitted the virus to about 36 per cent. of the plants colonized with infective adults. Grown under controlled glasshouse conditions about 4 per cent. of the commercial cowpea seed produced infected seedlings. The dilution end point of the virus in crude sap lies between 1 in 50,000 and 1 in 10,000. It withstands exposure for ten minutes at 85° C., but is inactivated at 90°. Infectivity of the virus was lost after 15 days at 24°, but not after nine. The virus also infected asparagus bean (*V. sesquipedalis*), *Phaseolus lantanus* [? *lunatus*], and *Canavalia ensiformis*.

McLean has described a mosaic disease of cowpea [caused by a strain of cucumber mosaic virus: ibid., xx, p. 444] and Snyder reported a similar disease of *V. sesquipedalis* [ibid., xxi, p. 514]. The transmission by sap, seed, and aphids, and the symptoms produced on the host resemble those of the Poona disease, but the physical properties show marked differences so that the latter virus is considered distinct from cowpea and asparagus bean mosaic viruses.

REITSMA (J.) & SLOOF (W. C.). **Brachysporiosis of Talinum triangulare (Jacq.) Willd.**—*Chron. Natur.*, ciii, 6, pp. 92–94, 5 figs., 1947.

This disease of *Talinum* [*T. angulare*] leaves [used for spinach and salads] caused by *Brachysporium robustum* n.sp. was first observed in the experimental vegetable garden at Moeara near Buitenzorg. The first symptoms are diminutive, slightly

raised, red-brown spots scattered over the mature leaves, and usually first visible on the lower surfaces of the leaf. The spots may enlarge to circular patches about 5 mm. in diameter, the centre becoming translucent, parchment-like and brittle, often making holes. When stalks and petioles are attacked they show elongated lesions. Sporulation occurred only in a moist chamber. Only the *Brachysporium* was isolated from the diseased leaves. Grown on Thaxter's agar it produced a submerged and, after six days, an aerial, dark grey mycelium. Abundant fructification occurred within two weeks at 28° C. The creeping mycelium was at first hyaline, later green or olivaceous; the dark, septate conidiophores were erect or procumbent, simple or sparsely branched, 100 to 400 by 7 to 10 μ wide, proliferating laterally after having produced a conidium. Obovate, 3- to 6-septate, dark brown, opaque conidia with a hyaline outer membrane, and measuring mostly 56 by 26 μ were borne singly terminally.

Under humid conditions, within 24 hours after inoculation with mycelium or spores, definite lesions were produced from which the fungus was reisolated. Control measures are considered to be unnecessary.

SEVERIN (H. H. P.). **Transmission of virus of Pierce's Grapevine disease by spittle insects.**—Abs. in *Phytopathology*, xxxvii, 5, p. 364, 1947.

The following spittle insects have been shown to act as vectors of Pierce's grapevine disease virus [lucerne dwarf virus: *R.A.M.*, xxvi, p. 377]: *Aprophora angulata, A. permutata, Clastoptera brunnea, Philaenus leucophthalmus* and its vars. *leucophthalmus, pallidus, fabricii, marginellus, spumarius*, and *impressus*.

COOK (M. T.). **Viruses and virus diseases of plants.**—x+244 pp., 23 figs., Minneapolis Burgess Publishing Company, 1947. $4. [Mimeoprinted.]

This revision of the author's earlier work [*R.A.M.*, xxv, p. 539] brings the development of the subject up to 1946.

N.S.W. Department of Agriculture. Biological Branch-Division of Science Services. Plant disease survey for the twelvemonth period ending 30th June, 1946. Sixteenth Annual Report.—33 pp. [? 1947. Mimeographed.]

This valuable survey of the diseases affecting economic and ornamental crops in New South Wales during 1945–6 [cf. *R.A.M.*, xx, p. 558] has been compiled by officers of the Plant Pathological Section, Biological Branch, New South Wales Department of Agriculture, some of the data on diseases of sugar-cane having been provided by the Colonial Sugar Refining Company, Ltd., and certain information being supplied by the Specialist and Field Officers of the Divisions of Horticulture and Plant Industry. Some of the records have already been noticed from other sources [ibid., xxv, p. 560; xxvi, pp. 74, 123, 330]. New records for the State include *Sclerotium rolfsii* causing rot of Roman hyacinth [*Hyacinthus orientalis* var. *albulus*] and crown rot of *Anemone japonica, Gloeosporium* leaf spot of *Adiantum, Phytophthora* collar rot of *Daphne* sp. and crown and root rot of honesty [*Lunaria annua*], and [tomato] spotted wilt virus on *Hoya carnosa*. Banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: ibid., xxv, p. 99; xxvi, p. 401] was widespread but not unusually destructive. Few growers spray at present. Good control was again obtained at Duranbah by four sprays at monthly intervals.

CHAVES BATISTA (A.). **Principais doenças das plantas, em o nordeste.** [Principal plant diseases in the north-east.]—*Bol. Agric., Pernambuco*, xiv, 1, pp. 5–46, 54 figs., 1947.

The following are among the numerous records comprised in this second instalment of the author's survey of the diseases of cultivated plants in Pernambuco,

Brazil, with recommendations for their control [*R.A.M.*, xxvi, p. 287]. Malvaceae of various kinds, widely cultivated as ornamentals, are very subject to infection by rust (*Puccinia malvacearum*). Orchids of the genera *Laelia* and *Cattleya* suffer from anthracnose (*Colletotrichum* and *Gloeosporium* spp.) [ibid., xxi, p. 202], especially when maintained under insufficiently humid conditions. An undetermined species of *Phytophthora* is responsible for black rot of *Laelia* at Recife [cf. ibid., xxv, p. 502]. *Hemileia oncidii* occurs in a mild form on *Oncidium* spp. A Californian poppy [*Eschscholtzia californica*] wilt of major economic importance is caused by *Sclerotium rolfsii*. Rose diseases include black spot (*Diplocarpon rosae*) and crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*).

Bacterial canker (*P.* [*Xanthomonas*] *vesicatoria*) infects both chilli and tomato, the former also being attacked by *Glomerella cingulata*. Tomatoes are liable to severe infection by anthracnose (*C. phomoides*), *Fusarium* wilt (*F. bulbigenum* var. *lycopersici*), which is also pathogenic to chilli at Recife, and bacterial wilt (*P.* [*X.*] *solanacearum*).

Pathogens of peas include *Ascochyta pisi*, *A. pinodella*, *Mycosphaerella pinodes*, and *C. pisi*. Squash and cucumber are attacked by *Cercospora cucurbitae* [ibid., xxi, p. 47] and the former also by *Puccinia cucumeris*. *Mucuna* spp. are subject to infection by *C. mucunae* [? *C. stizolobii*: ibid., xv, p. 779; xix, p. 692]. *Phytomonas* [*Xanthomonas*] *campestris* is the agent of a destructive black rot of mustard seedlings.

'Pitomba' [*Eugenia luschnathiana*] fruits are commonly affected by scab (*Elsinoe talisiae*) both in Parahyba and Pernambuco. Considerable damage is caused in the date plantations of Bahia and Pernambuco by smut (*Graphiola phoenicis*) [ibid., xvii, p. 504].

South American leaf blight (*Dothidella* [*Melanopsammopsis*] *ulei*) [ibid., xxvi, p. 416] is widespread, especially in Bahia, in young (under ten-year-old) *Hevea* rubber plantings. Sisal anthracnose (*C. agaves*) [ibid., xvii, p. 322] was observed for the first time in Pernambuco.

Downy mildew (*Plasmopara viticola*) and anthracnose (*E. ampelina*) are the most important vine diseases in north-eastern Brazil.

Tai (F. L.). **A preliminary list of economic plant diseases of Yunnan.**—*Bull. Inst. agric. Res., Tsing Hua Univ.*, 6, 36 pp., 1941. [Chinese, with English summary. Received August, 1947.]

This annotated list of diseases affecting economic plants in Yunnan relates to general crops, fruit trees, vegetables, special crops, and ornamentals. Information is given on the distribution and intensity of the several diseases. Many of the 202 pathogens enumerated are stated to be new records for China.

Gordon (Ruth E.) & Smith (N. R.). **Preservation of certain micro-organisms under paraffin oil.**—*J. Bact.*, liii, 5, p. 669, 1947.

Cultures of many kinds of bacteria can be satisfactorily preserved by covering the short agar slants or stabs with sterile paraffin oil to a depth of at least ½ in. About every six months viability is determined by transferring some of the growth under the oil to a fresh tube of a suitable medium.

Taylor (E. Shirley). **The assimilation of amino-acids by bacteria. 3. Concentration of free amino-acids in the internal environment of various bacteria and yeasts.**—*J. gen. Microbiol.*, i, 1, pp. 86–90, 1947.

The results of experiments at the Biochemistry Department, Cambridge, show that there is a definite distinction between Gram-negative and Gram-positive organisms in that 16 of the latter (13 bacteria and three yeasts) were able to

assimilate glutamic acid and lysine into their cells from the external medium and to concentrate these free amino-acids in the internal environment, whereas the cell walls of the 11 Gram-negative bacteria tested did not allow this assimilation.

GOIDÀNICH (G.). **Il ritorno della 'malattia dei cereali'.** [The return of the 'cereal disease'.]—Reprinted from *Italia agric., 1947*, 1, 7 pp., 5 figs., 1947.

In 1895 and 1896 wheat, barley, and oats in southern and central Sardinia were attacked by a disease causing extremely heavy losses, attributed by Berlese and Saccardo to *Sphaeroderma damnosum* [*R.A.M.*, x, p. 20], the imperfect state of which they considered was *Fusarium culmorum*. This disease recurred in the spring of 1946, when the damage was even more severe. The first symptoms appeared as a yellowing of the apex and later the whole of the leaf blade. Subsequently, the stem rapidly withered. The affected plants soon died, or, more commonly, maintained a sickly growth with almost empty inflorescences.

Isolations from infected material in every instance yielded *F. culmorum*, while *S. damnosum* was also obtained. It seems likely that the latter is parasitic not on the plants but on *F. culmorum*, or that the presence of *F. culmorum* brings about conditions suitable for the development of *S. damnosum*.

F. culmorum lives saprophytically on cereal residues and becomes parasitic at a particular state of susceptibility of the host, due to certain meteorological and soil conditions. The parasitism becomes progressively more marked as the factors which reduce host vitality correspond more closely with those that favour the fungus. The 1946 outbreak was favoured by persistent drought during the previous winter, soil impoverishment due to the lack of fertilizers during the war, and abundant rain with relatively high temperatures in the first fortnight of March. The first symptoms appeared 15 to 20 days after the rain.

In view of the amount of inoculum left on cereal residues after an outbreak, every precaution should be taken to ensure the health of the crops, including burning the stubble, careful preparation of the soil, and seed selection and disinfection.

It is stated in a footnote that other work by the author and A. MEZZETTI has since demonstrated that *S. damnosum* and *F. culmorum* are entirely independent organisms, though the growth and multiplication of the former are strongly affected by the presence of the latter (see 'Rapporti tra *Sphaeroderma* e *Fusarium*', *Nuovo G. bot. ital.*, N.S., 1947).

HURD-KARRER (ANNIE M.) & RODENHISER (H. A.). **Structures corresponding to appressoria and substomatal vesicles produced on nutrient-solution agar by cereal rusts.**—*Amer. J. Bot.*, xxxiv, 7, pp. 377–384, 7 figs., 1947.

On agar containing mineral nutrients and glucose (M/5 magnesium sulphate 2·5 c.c.; M/2 ammonium nitrate 0·5 c.c.; M/2 calcium nitrate 1·5 c.c.; M/5 potassium dihydrate 1·5 c.c.; M/5 di-potassium hydrogen phosphate 2·5 c.c.; 0·5 per cent. ferric tartrate 0·5 c.c.; glucose 20 to 60 gm.; distilled water to 1,000 c.c.; agar 20 gm.), uredospores of *Puccinia graminis tritici*, *P. triticina*, *P. dispersa*, *P. coronata*, *P. hordei* (syn. *P. simplex*) [= *P. anomala*], and *P. sorghi* [*P. maydis*] produced primary and secondary vesicles that correspond to appressoria and substomatal vesicles, as they develop in and on the respective host plants. The morphological characteristics of the secondary vesicle, homologous with the substomatal vesicle, differed in each species.

Details of shape, size, and septation of the secondary vesicles and the number of infection hyphae growing from them usually conform closely to the descriptions by Pole Evans (*Ann. Bot., Lond.*, xxi, pp. 441–446, 1907) of the substomatal

vesicle of the respective species as it occurs within the substomatal chamber of the host plant.

The bodies identified as appressoria (primary vesicles) and substomatal (secondary) vesicles on nutrient agar were not formed on water agar. It is thought to be the first report of these structures being formed outside the host. Only occasional hyphae (not more than 1 in 1,000) produced the bodies; they were most common in *P. triticina* and *P. dispersa* and rare in *P. maydis*. The vesicles were produced above the substrate and the infection hyphae grew out into the air from the secondary vesicles to a maximum of 316 μ. None of these hyphae showed any tendency to haustorium formation. The development on agar of a structure corresponding to an appressorium shows that there is a tendency for their formation in the absence of any stimulus from the plant.

PEKLO (J.). **Přehled nových poznatků o šlechtění Pšenic proti rzivosti. Šlechtění Pšenic proti žluté rzivosti. Vlastní pokusy a šlechtění.** [Results of recent studies on the breeding for immunity of yellow rust-resistant Wheat varieties. Wheat breeding against yellow rust. Own experiments and breeding.]—*Zem. Arch.*, xxxiii, 9–10, pp. 444–458, 459–522, 7 figs., 1942. [German summary. Received May, 1947.]

Recent experiments by various workers up to the end of 1941 in breeding yellow rust (*Puccinia glumarum*) -resistant wheat varieties are discussed in the first part of this work [*R.A.M.*, xxiv, p. 359; xxv, p. 550]. The points reviewed include the races of the fungus, the factors affecting the disease, and the genetics of resistance. The author refers to the difficulties of growing *P. glumarum* in pure culture and proposes experiments with carotinoids as culture media for this purpose.

The second part deals with the author's experiments in breeding yellow rust-resistant wheat varieties [ibid., xii, p. 360] in Czechoslovakia. In 1930 two resistant types derived from Jinonice × Grenadier II and from Kottengrenadier × Kubanka were crossed and the hybrid was a practically immune and high-yielding type called UP, in which the influence of heterosis was markedly noticeable. From 1936–38 UP was cultivated as winter wheat in the Českomoravská vysočina (about 500 m. above sea-level), where severe yellow rust was expected. The yields of UP in comparison with Dreger, a good-quality winter wheat, were: in 1936, a very severe yellow rust year, 32·55 quintals per ha., 27 per cent. higher than Dreger; in 1937, when there was less rust, 30 q. and 10 per cent.; and in 1938, a year of very severe epidemic, 33·92 q. and 24 per cent., respectively.

CRITOPOULOS (P. D.). **Production of teliospores and uredospores of Puccinia graminis on Berberis cretica in nature.**—*Mycologia*, xxxix, 2, pp. 145–151, 1 fig., 1947.

The alternate host of *Puccinia graminis* in Greece is *Berberis cretica*, the only wild barberry there, and it is attacked annually by *P. graminis*. The author has reported the finding of teleutospores and uredospores of this rust on *B. cretica* [*R.A.M.*, xxvi, p. 188] at high altitudes. They correspond exactly to those ordinarily found on the grass hosts. The brown to black teleutosori, 0·3 mm. in diameter, appear in the middle of July just before the leaves fall and are sparsely produced at the edges of aecidial spots on either side of the leaves. Separate uredosori were not found but uredospores were found among the teleutospores. These states have been reported only once on barberry (*B. vulgaris*) and then by artificial inoculation [ibid., xvii, p. 449]. Spermogonia and aecidia are formed on *B. cretica* as well as teleutospores and a limited number of uredospores. It is postulated that *P. graminis* might be in the process of forming a correlated microcylic species with teleutospores on *B. cretica*. From their close proximity it appears

that the teleutospores and uredospores were developed from the same mycelium which bore the aecidia. Teleutospores from the grass hosts in Greece are not viable during long periods of heat or dryness at lower altitudes. Kept under natural conditions there is only 0·5 per cent. germination in the spring. Therefore the production of these spores on *B. cretica* is considered to be the natural adjustment of the fungus to produce the resting spores at high altitudes where their germinating power is more likely to be sustained.

BENLLOCH (M.). **Contribución al establecimiento de un método para ensayar los desinfectantes contra el 'tizón' del Trigo (Tilletia tritici (Bjerk.) Wint. y T. laevis Kühn).** [Contribution to the establishment of a method for the assay of disinfectants against Wheat 'bunt' (*Tilletia tritici* (Bjerk.) Wint. and *T. laevis* Kühn).]—*Bol. Pat. veg. Ent. agric., Madr.*, xiv, pp. 157–168, 15 figs., 1946.

The usual methods for the assay of disinfectants against wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetida*] having proved ineffectual, the author devised a technique involving (1) tests of spore germinability, (2) *in vitro* experiments on the fungicidal action of the chemical, (3) germination tests on the spores under experimental conditions, (4) the setting-up of an effective control, (5) studies on the action of the disinfectant, and (6) studies on the effects of the disinfectant on the germination and development of the plants.

The best results in the germinability tests were obtained by placing the spores on filter paper over a solution of 1 per mille calcium nitrate in a moist chamber. Thus, spores of *T. foetida* collected from wheat 4½ years after harvesting germinated in a fortnight at the somewhat unfavourable temperature of 22° C., and those from samples harvested a year and eight months earlier germinated profusely in six days. Spores of *T. caries* germinated in five days under the same conditions. In another test *T. foetida* spores of the previous year's harvest germinated in three days in the moist chamber at 17°.

In laboratory assays of toxicity two moist chambers are used, in one of which *T. foetida* spores are laid on filter paper soaked in tap-water, while in the other they are placed on filter paper, impregnated with the disinfectant to be tested. At weekly intervals counts are made of the germinated spores. None had germinated on the chemically treated substratum at the end of three weeks.

For the observation of spore germination under experimental conditions one or two seeds with adhering spores are sown in flower-pots and counts made within the next ten days, special attention being paid to the basidiospores and conidia, from which the infective mycelium arises.

For the routine tests of disinfectants 100 wheat seeds contaminated by *T. foetida* spores were sown in a flower-pot and one removed daily for observation. Germination began on the seventh day and by the tenth both chlamydospores and basidiospores were germinating profusely, the wheat meanwhile passing through the critical stage for infection. When the plants were two months old, eight were selected at random and transplanted: they produced 21 ears, of which 17 (81 per cent.) were entirely diseased. The relative efficiency of different fungicides can be determined by their application to samples of the same seed under identical conditions. In these experiments two commercial preparations were used, one containing an organic mercury salt and the other a copper compound as active principles. In none of the pots, each containing 100 seeds treated with one or other of these chemicals, were germinating spores of *T. foetida* detected up to 17 days after sowing; the 21 ears formed in the mercury and the four in the copper series were all completely healthy. Among the adverse effects induced by excessive or unequal dosages of certain fungicides are atrophy of the root system and stunting or abortion of the seedlings.

Pichler (F.). **Die Bekämpfung des Schneeschimmels (Fusarium) mit chemischen Mitteln im Spätherbst.** [Snow mould (*Fusarium*) control with chemical preparations in the late autumn.]—*PflSch. Ber., Wien*, i, 1–2, pp. 14–26, 1947.

Of the chemicals tested at the Vienna Plant Protection Institute, mostly during the war years, for the control of snow mould (*Fusarium*) [*nivale: Calonectria graminicola*] on the highly susceptible Melker rye variety [*R.A.M.*, xvii, p. 20], the best results were given by the spraying or dusting of the seedlings during November with borax at the rate of 5 gm. per sq. m., 50 per cent. ceresan dust (10 gm.), phenyl mercury pyrocatechol (10 gm.), preparation P (5 or 10 gm.), boric acid (5 gm.), and fusariol and germisan dusts, both at 50 per cent. and 10 gm. per sq. m. It is essential to the elimination of the pathogen that the treatments should be applied in conjunction with appropriate cultural measures [ibid., xii, p. 623].

Littauer (F.) & Gutter (J.). **Sclerotium bataticola Taubenhaus as causal agent of a rot of Shamouti Oranges.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 261–262, 3 figs., 1946. [Hebrew summary.]

Sclerotium bataticola [*Macrophomina phaseoli*] was isolated for the first time from a decaying Shamouti orange found in a grove near Lydda, Palestine. The light brown rot, resembling that due to *Diplodia natalensis*, extended along the segments from the button to the stylar end. The sclerotia produced in culture did not exceed 100 μ in diameter and the fungus would appear, therefore, to fall in Haigh's C group [*R.A.M.*, xii, p. 727]. Fruits of the same variety inoculated with *M. phaseoli* and incubated at 24° C. developed symptoms similar to those obtained by Weindling and Miller in inoculation tests in California (cited by Fawcett in 'Citrus diseases and their control', p. 464, 1936) [ibid., xv, p. 574]. Isolates of the fungus from other sources induced a rotting of Shamouti oranges comparable with that described above.

Asthana (R. P.). **Latent wither-tip infection on Citrus.**—*Proc. Indian Acad. Sci.*, Sect. B, xxiv, 5, pp. 243–245, 1946.

The strain of *Colletotrichum gloeosporioides* isolated on rice meal agar from the pinkish-white areas on the bark of orange trees affected by wither-tip of the trunk and branches in the Central Provinces and Berar corresponds to Chaudhuri's strain A No. 316 [*R.A.M.*, xv, p. 496] and falls approximately within the second group of R. E. D. Baker *et al.* [ibid., xix, p. 663]. Its unicellular, oval conidia, pinkish in the mass, measured 8·46 to 15 by 4·13 to 7 (average 5·5 by 13) μ, and the quadri- to quinquecellular setae were 56 to 133 μ in length. The mycelium survives the adverse atmospheric conditions of the summer months as pink stromata in cortical fissures, and persists as an inter- and intracellular parasite in one or two layers of the bark tissue. Inoculation experiments on the branches of three-year-old orange plants resulted in the development of typical wither-tip symptoms and the reisolation of the fungus from the infected tissues. In agreement with Baker's observations in Trinidad [ibid., xviii, p. 193], the author consistently noted the presence of acervuli on dead wood.

Haas (A. R. C.). **Varietal susceptibility to boron deficiency or excess in Citrus.**—*Proc. Amer. Soc. hort. Sci.*, xlviii, pp. 40–42, 1 fig., 1946.

In experiments under controlled conditions at Riverside, California, in 1945, rough lemon rootstocks proved to be less susceptible than sour orange to boron deficiency and more so to an excess of this element [*R.A.M.*, xxv, p. 447]. The differences are attributed to the more active absorption of boron by the former than by the latter species.

RAMSEY (G. B.), SMITH (M. A.), & HEIBERG (B. C.). **Fungistatic action of diphenyl on Citrus fruit pathogens.**—*Bot. Gaz.*, cv, 1, pp. 74–83, 3 figs., 1944. [Received May, 1947.]

The effect of diphenyl vapour on the growth of ten citrus fruit pathogens cultivated on potato dextrose agar was investigated [*R.A.M.*, xxvi, p. 111]. *Botrytis cinerea*, *Diplodia natalensis*, and *Penicillium italicum* were totally inhibited, and *P. digitatum* to a great extent; *Phomopsis* [*Diaporthe*] *citri* was moderately checked, and *Alternaria citri* and *Colletotrichum gloeosporioides* only slightly so. Apparent recovery from the initial shock of the chemical was exhibited by *Sclerotinia sclerotiorum* and *Trichoderma viride*. Only *Phytophthora citrophthora* showed increased growth in the presence of diphenyl vapour. Spore germination of *A. citri* and *C. gloeosporioides* was apparently unaffected; that of the other species was retarded but not inhibited. On removal of diphenyl the organisms resumed growth and spore production.

Unwrapped oranges placed in cup-like depressions in special paper-pulp trays impregnated with diphenyl developed only 1 per cent. decay when the trays were packed in tight fibre-board boxes for three weeks at 72° F. and 40 per cent. humidity whereas the controls developed 25 per cent. rot.

It is considered that *Penicillium italicum*, *B. cinerea*, *Diplodia natalensis*, *P. digitatum*, and *Diaporthe citri* can be effectively checked by diphenyl vapours but these are not likely to control satisfactorily *A. citri*, *C. gloeosporioides*, *Phytophthora citrophthora*, *S. sclerotiorum*, and *T. viride*.

SCOTT (FLORA M.) & BAKER (KATHERINE C.). **Anatomy of Washington Navel Orange rind in relation to water spot.**—*Bot. Gaz.*, cviii, 4, pp. 459–475, 56 figs., 1947.

The symptoms of water spot in ripening Washington Navel orange [*R.A.M.*, xix, p. 144] are waterlogging and subsequent cracking of the rind. The epidermis is structurally weak and excessive water absorption during winter rains often upsets the critical balance between the epidermal extension and increase in volume of the underlying tissues. The resulting cracks may heal in dry weather by normal cicatrization but in continuous rain may remain open and give entrance to fungal spores. Even after this extensive anatomical investigation of the rind it is still doubtful why the Washington Navel variety should be more susceptible to water spot than other varieties which ripen at the same time, as there are no apparent differences in rind structure. The latter evidently remains unaffected by oil-spraying [cf. ibid., xxi, p. 368], and no anatomical difference is observed between untreated fruits and those which have been oil-sprayed or even oil-dipped.

MOREIRA (S.). **Observações sôbre a 'tristeza' dos Citrus, ou 'podridão das radicelas'.** [Observations on Citrus 'tristeza' or 'rootlet rot'.]—*Biológico*, viii, 11, pp. 269–272, 1942. [Received July, 1947.]

Reference has already been made to the author's investigations on the 'tristeza' form of citrus root rot in Brazil [*R.A.M.*, xxiii, p. 223; xxvi, p. 298]. The disease is believed to have originated in the Parahyba valley or in the vicinity of Sorocaba, São Paulo, and thence spread to Campinas, Limara, and Piracicaba. It has barely left a trace in Araras and Pintangeiras, where only sporadic cases of infection have been observed in contrast to the entire groves affected in other regions. In the Parahyba valley and Sorocaba dead groves were encountered, whereas in Campinas and Limeira up to 100 per cent. of the plants were diseased but the mortality was low. Superior cultural methods in the latter districts are presumed to account for the difference in the severity of the symptoms. The root rot was found to spread much more rapidly in cold, moisture-retaining soils than in dry, very permeable

ones, in which the disease takes years to reach a climax. Trees of all ages, from nursery plants to upwards of 20 years, are subject to root rot, the former sustaining much heavier damage than the latter under comparable conditions.

The following combinations were found to be susceptible to root rot: sweet on sour orange, Marsh Seedless grapefruit and 'mexiriqueira' tangerine on sour orange, and Galician lemon on sour orange; suspected cases were observed in sweet orange grafted on Persian lime; while Eureka and Sicilian lemons on sour orange, 'pear' orange on rugose lemon, and sweet orange on giant, clove, and 'ceipira' lemons appeared to be free from the trouble. Tangelo (*Citrus nobilis* $\times$ *C. paradisi*) scions grafted on sour orange showed differing varietal reactions to root rot, Thornton being very susceptible and Sampson perfectly resistant.

HALE (J. B.). **Mineral composition of leaflets in relation to the chlorosis and bronzing of Oil Palms in West Africa.**—*J. agric. Sci.*, xxxvii, 3, pp. 236–244, 2 graphs, 1947.

Several disorders resulting in foliar chlorosis and necrosis have recently appeared among the oil palms of Nigeria, and in view of the possibility that a mineral deficiency might be concerned in the troubles, samples of diseased material from three estates were submitted to the Rothamsted Experimental Station for analysis.

The first symptoms of the 'lemon frond' disease are the appearance in one of the upper or middle leaf whorls of clear lemon-yellow fronds, which often die as a sequel (according to F. W. Toovey, Senior Botanist, Nigerian Department of Agriculture) to gummosis of the water-conducting vessels of the bundles in the outer periphery of the stem. The disturbance seems to be seasonal, developing as a rule towards the close of the rains. Some cases of grouping of 'lemon frond' have been observed, but many of the affected palms are surrounded by vigorous, healthy ones.

'Bronzing' is the term applied to a condition in which the foliage, usually the middle and lower parts of the crown, is of a bronzed or coppery tinge instead of dark green. The older fronds are most severely attacked and may be bronzed all over, the middle ones are speckled with small, bronze patches, while the upper remain green. A distinct form of this disease, known as 'speckled bronzing', begins with the formation of pale greenish spots scattered over the entire lamina, subsequently turning orange-red and sometimes coalescing to cover a considerable proportion of each leaflet. In the more general type of bronzing the tips and edges of the fronds on the lower leaves acquire an orange-yellow tint and eventually die in much the same way as in the marginal leaf scorch commonly associated with potassium deficiency in many other crops.

'Patch yellowing' starts with moist, brown patches on both surfaces of the unopened leaflet. As the spear opens the patches expand and either turn yellow or shrivel and fall out, imparting a very ragged aspect to the palm.

A disorder originally called 'yellowing disease' [*R.A.M.*, xxii, p. 248] by F. W. Toovey is now believed by the same authority to be similar to, if not identical with, one of the above-mentioned forms of bronzing. The fronds are covered with a mass of small, necrotic spots of varying colour, size, and shape, and ultimately wither and turn grey, becoming so brittle that they break off, leaving the midrib bare.

The bronzing diseases are tentatively attributed, on the basis of chemica analyses, to potassium deficiency, probably combined in one instance with shortage of magnesium. 'Lemon frond' cannot be ascribed to a lack of any of the elements investigated, viz., potassium, calcium, magnesium, and manganese.

The differences in mineral composition of the fronds between palms from the three estates exceed those due to the diseases, and a further survey is planned to determine the range of variation of healthy trees in this respect and the levels below which deficiencies set in.

ERGLE (D. R.). **The glycogen content of Phymatotrichum sclerotia.**—*J. Amer. chem. Soc.*, lxix, 8, pp. 2061–2062, 1947.

The glycogen detected in a recent chemical study in the sclerotia of soil cultures of *Phymatotrichum omnivorum*, the agent of cotton root rot, at the Texas Agricultural Experiment Station [*R.A.M.*, xxvi, p. 299], was shown to occur in two forms, viz., (1) free, readily extractable with hot water, and (2) bound, insoluble in hot water but soluble after treatment with hot 35 per cent. potassium hydroxide. Full details are given of the experimental methods used in isolation and purification. The yield of free glycogen from 30 gm. fresh sclerotia amounted to 1·1 gm. or 10·1 per cent. of the dry weight and that of the bound to 2·9 gm. (26·6 per cent.). No differences were found in the chemical properties of glycogen from the two fractions: particulars are given of those of the bound form.

COUCH (J. N.) & DODGE (H. R.). **Further observations on Coelomomyces, parasitic on Mosquito larvae.**—*J. Elisha Mitchell sci. Soc.*, lxiii, 1, pp. 69–79, 6 pl., 1947.

In continuation of his studies of *Coelomomyces* [*R.A.M.*, xxiv, p. 504; xxv, p. 560] the senior author has examined large numbers of parasitized mosquito larvae sent to him by H. R. Dodge from Georgia. Several undescribed species of the genus were found and additional information was obtained. Germination of the resting sporangia of *C. dodgei*, *C. punctatus*, and *C. lativittatus*, without preliminary drying, has been observed [ibid., xxiii, p. 16]. The contents of the sporangium swelled, bulging out through the fissure to form a dome-shaped mass. The zoospores were formed after 24 to 36 hours, their structure and method of swimming being typical of the Blastocladiales. Attempts to infect larvae of *Anopheles crucians* with zoospores from resting sporangia of *C. dodgei* were unsuccessful.

According to the observations of Dodge, the ratio of infected larvae to healthy ones is negligible; Muspratt [ibid., xxv, p. 500], however, estimated the mortality of *A. gambiae* due to a species of *Coelomomyces* to be as high as 95 per cent. from 1941 to 1945. Further investigations are required before any conclusion can be drawn as to the possible effectiveness of species of *Coelomomyces* in the biological control of mosquitoes.

ALTSON (R. A.). **A fungus parasitic on Coptotermes curvignathus, Holmgr.**—*Nature, Lond.*, clx, 4056, p. 120, 1947.

During the course of studies designed to determine the best conditions for maintaining workers of *Coptotermes curvignathus* (the termite pest of *Hevea* rubber) in captivity, an unusually high death rate was observed. An examination disclosed that the insects had been attacked by an Entomophthoraceous fungus which was isolated and cultured without difficulty on standard media and on rice bran. Feeding experiments with the infected rice bran resulted in a 100 per cent. kill of *Coptotermes* workers within 48 hours, the presence of the characteristic hyphae in the tissues of the insects being established.

A relationship seems to exist between this parasite and the species of *Conidiobolus* isolated from *Nasutitermes* by Kevorkian in Cuba [*R.A.M.*, xvi, p. 745]. However, the Imperial Mycological Institute, to which a culture was sent, considers that the Malayan fungus differs slightly from the Cuban one, particularly in its primary conidia which are distinctly larger, and it has not been observed to form villose resting spores. Pending comparison with authentic material, it is regarded provisionally as a new species of *Conidiobolus*.

FLOR (H. H.). **Genetics of pathogenicity in Melampsora lini.**—*J. agric. Res.*, lxxiii, 11–12, pp. 335–357, 1946.

The mode of inheritance of pathogenicity in flax rust (*Melampsora lini*) was studied at the North Dakota Agricultural Experiment Station [*R.A.M.*, xxi, p. 80

and next abstract] by determining the reaction of 16 differential flax varieties to F_2 cultures of the pathogen derived from crosses between races 6 and 22 and between 22 and 24. All except Bombay and J.W.S. were susceptible to race 22 (of South American origin). Buda was moderately susceptible to race 24 (North American) and Williston Golden, Williston Brown, and Bombay susceptible, while race 6 (North American) was highly pathogenic only to Williston Golden and Williston Brown. Virulence of *M. lini* in all the differential varieties except the two last-named was inherited as a recessive character. No F_2 culture approximated to parent race 22 in virulence as measured by the number of varieties attacked. From the 133 F_2 cultures of hybrids between races 22 and 24, 64 races were identified, of which only two had been isolated previously, while of the 39 races produced by 98 F_2 cultures from the 6×22 cross only three had been collected before. Bombay was immune from races 6 and 22 and from all the F_2 cultures derived from them.

Segregating ratios and tests for independent assortment of factors indicated that for each pair of factors conditioning rust reaction in the host there is a corresponding pathogenic pair in the parasite. The F_2 cultures of crosses between races 22 and 24 segregated for pathogenicity in Pale Blue Crimped, Kenya, Akmolinsk, Abyssinian, Leona, Ottawa 770 B, Bombay, Newland, and Tammes Pale Blue, varieties having one pair of factors for resistance to the avirulent parent race 24, in a single-factorial ratio; in Bolley Golden and Italia Roma, with two pairs of factors for resistance to the avirulent parent, in a bifactorial; and in Morye, with three pairs of factors for resistance to the avirulent parent, in a trifactorial. Buda was more or less susceptible to both parent races and to all their F_2 progeny while J.W.S. was immune from the four parents and all 231 F_2 cultures.

The χ^2 test of F_2 cultures of hybrids between races 22 and 24 for independent assortment showed the factors for virulence in Pale Blue Crimped, Kenya, Akmolinsk, Abyssinia, and Leona to be so closely linked as to be inherited as a unit. A similar mode of inheritance was established for pathogenicity in Williston Golden and Williston Brown, varieties with a common factor for resistance to certain cultures of this cross. One of the pairs of factors for virulence in Bolley Golden was identical or closely linked with one of those responsible for pathogenicity to Italia Roma. The pair of factors involved in the development of severe infection on Tammes Pale Blue was the same as one of the three pairs of factors concerned in virulence in Morye or closely allied to it.

Analysis for independent assortment of the F_2 cultures from the 22×24 cross showed that 768 races with marked differences in pathogenicity are obtainable theoretically from this cross. There was no indication of allelomorphic or linkage relations between the factors for virulence of race 24 in Bombay and any of those for pathogenicity of race 22 in the 14 differential varieties attacked by it, so that this cross should yield a race capable of infecting all the differential varieties except J.W.S.

It is concluded that the greatest danger to the North American rust-resistant flax varieties lies in the introduction from other regions, particularly South America, of a race which will attack them.

Flor (H. H.). **Inheritance of reaction to rust in Flax.**—*J. agric. Res.*, lxxiv, 9–10, pp. 241–262, 1947.

The interaction of the factors responsible for reaction to rust (*Melampsora lini*) in 20 flax varieties, including the 16 that have served as differentials for the identification of physiologic races of the pathogen [see preceding abstract], was studied by determining the reaction of F_2 populations of crosses between resistant and susceptible varieties. Using selected races of the fungus, it was demonstrated that at least 19 distinct pairs of factors are implicated in conditioning the response to *M. lini* of the 16 differential varieties. Of these 19 pairs, 16 lie in three series or

linkage groups, viz., 7 in the Ottawa 770 B, or *LL*, 4 in the Newland, or *MM*, and 5 in the Bombay, or *NN* series. No crossing-over was observed between factors in either the *LL* or the *MM* linkage groups, and the factors in each of those series are considered to be allelomorphic. Some crossing-over and irregular segregation ratios occurred in hybrids between varieties having factors in the *NN* series, and these are deemed to be linked rather than allelomorphic. Supplementary rust-conditioning factors were found in the four varieties studied in addition to the differentials, namely, Billings, Minn, 25–107, Pale Verbena, and Rio.

The varieties in which single factor-pairs in the *LL* series are responsible for reaction to *M. lini* are Ottawa 770 B, J.W.S., Pale Blue Crimped, and Kenya. One of the two pairs of rust-conditioning factors in Buda, Williston Golden, Bolley Golden, Italia Roma, and C.I. 416–3 lies in the *MM* allelomorphic series. Probably the *MM* factors in Williston Brown and Williston Golden are identical, and those in Bolley Golden and Italia Roma may be so too.

Single pairs of factors in the *NN* linkage group condition the response to rust in Bombay, Akmolinsk, Abyssinian, Leona, and Tammes Pale Blue. The factors in Bombay and Punjab appear to be identical. One of the two pairs of factors concerned in rust development in Italia Roma may lie in the *NN* linkage group.

One pair of rust-conditioning factors in Bolley Golden and two pairs in Morye have not been assigned to any of the three series. Reaction to *M. lini* in Rio is conditioned by three pairs of factors, one apparently lying in each of the allelomorphic series.

A parallelism in linkage was established between some of the factors for rust reaction in the host and those for pathogenicity in *M. lini*. Virulence in Pale Blue Crimped (L^3L^3) and Kenya (L^4L^4) was inherited as a unit, as was also virulence in Akmolinsk (N^1N^1), Abyssinian (N^2N^2), and Leona (N^3N^3). However, pathogenicity of *M. lini* towards these three varieties was also linked with that towards Buda ($L^1L^1M^2M^2$), indicating that association between pathogenic factors transcends the linkage groups conditioning resistance in the host.

Borlaug (N. E.). **Variation and variability of Fusarium lini.**—*Tech. Bull. Minn. agric. Exp. Sta.* 168, 40 pp., 4 figs., 3 graphs, 5 diags., 1945. [Received May, 1947.]

A full account is given of a study of the variability of *Fusarium lini* [*R.A.M.*, xxvi, p. 397] in culture and on the host, the number and distribution of races within the species, the spread and persistence of the fungus in nature, and the environmental factors influencing infection.

The evidence obtained indicated that there are many races of *F. lini* differing physiologically, culturally, and pathogenically. When five flax varieties were inoculated with 13 North American monoconidial isolates of the fungus, it was clearly demonstrated that three definite pathogenic races were present, while minor differences suggested the presence of several others. Isolates 6 and 11, very similar in culture, were quite distinct pathogenically. Linota and N.D.R. No. 114 flax varieties were relatively resistant to isolate 6 and very susceptible to 11. Bison was very susceptible to 6 and resistant to 11. Isolate 1 was distinguished from all the others in that it killed a high percentage of pre-emergent plants of all five test varieties. There was some evidence that this race does not correspond to *F. lini* in all respects. The reaction of a flax variety inoculated with a given race in different experiments was found to be surprisingly consistent.

Eighteen isolates of *F. lini* were obtained from Argentina and several flax varieties inoculated with them. In pathogenicity this group proved distinct from most of the North American races; nearly all the cultures caused wilting in Bison and severe wilt in most of the other North American varieties tested. The North American isolates of *F. lini* that were tested many times in the greenhouse over a

period of two years always retained their identity, this being most apparent with 6 and 11.

Five inoculations were made with eight isolates on the same five test varieties. Again isolates 6 and 11 were very distinct in their differential effects and may be regarded as distinct races. The remaining isolates could not be distinguished as different races under the conditions of the test. Isolate 1, highly pathogenic in greenhouse tests, appeared to be non-pathogenic, probably owing to mutation in the stock culture. Striking antagonism between races 6 and 11 was observed in the field, and confirmed in the greenhouse.

No one flax variety of 20 varieties and lines tested was resistant to every isolate of *F. lini* (5 from South America, 20 from North America) used in the investigation. Most of the varieties and lines were at least moderately susceptible to four of the South American isolates. Bison, generally regarded as the most resistant variety in the United States, showed very slight resistance to any of the South American isolates except 22. South American isolate 24, though generally less virulent than the other South American ones, produced more rapid wilt in Biwing, II–36–p. 4 (C.I. 479×Bison), II–33–p. 105 (Bison×Newland), and Bolley Golden C.I. 977 than it did in Punjab. All 20 flax varieties tested were susceptible to South American isolate 25. While Koto, Zenith, Bolley Golden C.I. 976, II–33–p. 45, and II–33–p. 58 (the two last-named both progeny of C.I. 697×Bison) are not classed as resistant, they are resistant to a larger number of races of *F. lini* than some other recently introduced varieties, such as Redwing and Biwing. Some new varieties, e.g., Biwing, apparently resistant in the nursery, were susceptible to several races in the greenhouse.

Inoculations with numerous different forms of the group-species *F. oxysporum* [ibid., xix, p. 495] failed to establish any of them as wilt parasites of flax seedlings. Seventeen crop plants were tested in the greenhouse as possible hosts of *F. lini*, with only negative results.

The evidence indicated that there is a critical period for infection by *F. lini* if the plants are to develop typical wilt. This period is shorter for the more resistant varieties than for susceptible ones. Root wounding appeared to predispose some varieties to infection but not others.

NOBREGA (N. R.). **Uma doença de virus em Orquidea.** [A virus disease in the Orchid.]—*Biológico*, xiii, 3, p. 62, 1 pl., 1947. [English abstract.]

The virus responsible for chlorosis, mottling, and whitish flecking of the foliage and stunting in a *Dendrobium nobile* plant at the Biological Institute, Rio de Janeiro, was successfully transmitted by sap inoculations to White Burley tobacco, *Nicotiana rustica*, and *N. glutinosa*. The symptoms developing on these hosts suggest that a strain of *Cucumis* virus 1 [cucumber mosaic virus] is concerned in the etiology of the disease.

Plant diseases. Diseases of Carnations.—*Agric. Gaz. N.S.W.*, lviii, 6, pp. 313–316, 5 figs., 1947.

The four parasitic fungi causing root diseases and crown rot of carnations are *Sclerotium rolfsii* [*R.A.M.*, xvi, p. 368], which attacks during the summer, *Rhizoctonia* [*Corticium*] *solani* [ibid., xxv, p. 344] in the spring and autumn, *Fusarium* sp. [loc. cit.] affecting the crown tissues and roots and causing most damage in early summer, and *Phytophthora* sp. causing a firm brown rot of the crown during the cooler months of the year, but only in wet or badly drained soil. The leaf diseases of carnations which are most serious under humid conditions are rust caused by *Uromyces caryophyllinus* [ibid., xxiii, p. 236] and leaf spot (*Septoria dianthi*) [ibid., xxvi, p. 130]. Carnation mosaic, which affects all commercial varieties grown in the country, is also described. It is probably similar to the

mosaic affecting carnations in the United States [ibid., xxiv, p. 231] but the etiology has not been worked out. Control measures for the root diseases comprise crop hygiene, rotation, and fertilizer treatment, for the leaf diseases spraying with Bordeaux mixture or lime-sulphur and taking cuttings only from healthy plants.

BAKER (K. F.). **Heterosporium disease of Nasturtium and its control.**—Abs. in *Phytopathology*, xxxvii, 5, p. 359, 1947.

The extensive nasturtium [*Tropaeolum majus*] seed fields in the coastal districts of California are often severely damaged at midsummer by an undescribed *Heterosporium* leaf spot. The fungus, carried internally in up to 47 per cent. of the seed, infects the stem from the old seed and sporulates profusely after the plant breaks over at soil-level. Foliar infection takes place through hydathodes and insect injuries, and the plants are often leafless by harvest time. In the humid environment beneath the plants the pathogen penetrates pericarps and seeds. Green seed cannot be infected, even through wounds, until the pericarp becomes senescent, when rapid infiltration and sporulation occur. The causal organism persists for at least three years in the seed which, together with volunteer or carry-over plants, constitutes the primary source of infection in the field. Thirty minutes' immersion of the seed in water at 51·7° C., preceded by an hour in cool water, gave excellent control of the leaf spot, with only 3·3 per cent. average reduction in germination. The disease was also eliminated in large-scale trials by the sowing of treated seeds in areas free of infected plants.

BARRETT (J. T.) & HARDMAN (DORIS A.). **Myrothecium leaf spot and canker of Gardenia.**—Abs. in *Phytopathology*, xxxvii, 5, p. 360, 1947.

Myrothecium roridum was identified as the agent of a disease of *Gardenia* cuttings in rooting beds under very humid and warm conditions in California, this being the first report of its occurrence in the State. The successful transference of the pathogen to wounded and intact tomato plants and to needle-punctured tomato fruits affords partial confirmation of work previously carried out in England [*R.A.M.*, xxiii, p. 191].

GLENISTER (P. R.). **Effects of iron deficiency on respiration of Sunflower plants.**—*Bot. Gaz.*, cvi, 1, pp. 33–40, 10 graphs, 1944. [Received May, 1947.]

Sunflowers grown in sand culture with nutrient solution to which no iron salt (ferric citrate) was added developed chlorosis typical of iron deficiency. The respiration rate was depressed in the young leaves which contained only half as much iron as those on normally coloured control plants. No transference of iron occurred from the older leaves, which contained more iron, to the younger ones.

HOWARD (F. L.). **An organic cadmium fungicide for turf disease.**—*Greenk. Reptr*, xv, 2, p. 10, 1947.

In a comparative trial at the Rhode Island Agricultural Experiment Station in 1945 phenyl amino cadmium dilactate (0·1 lb. in 10 gals. water per 1,000 sq. ft.), zerlate, puraturf, and phygon [*R.A.M.*, xxvi, p. 211] were applied on 26th and 31st July to eight replicate plots of Piper velvet bent [*Agrostis canina*] for the control of copper spot (*Gloeocercospora* [*Ramulispora*] *sorghi*) [ibid., xxv, p. 397]. Fifty-eight days later the average infection on the plots treated with cadmium was only 0·8 per cent., compared with 6·2, 14·8, 34·3, and 24·3, respectively, on those sprayed with puraturf, zerlate, and phygon, and the controls.

In 1946 the cadmium compound was further tested with 23 other fungicides against dollar spot (*Sclerotinia homoeocarpa*) on *A. canina* and the Colonial, C 19, and C 15 varieties of creeping bent [*A. stolonifera*]. The first application was made on 4th to 5th June, before the disease was observed, and further treatments were

given at ten-day intervals. By 31st August, just after the ninth application, the cadmium-treated C 15 creeping bent plots were still free from infection, while 16 of the other fungicides permitted the development of 20 to 69 per cent. So severe was the disease (over 40 per cent. of the grass killed) on plots treated with ten experimental preparations that the cadmium complex was substituted in the last four applications, resulting in a reduction in the area of damaged grass to 10·4 per cent.

To test its curative properties phenyl amino cadmium dilactate was applied on 27th July, 1946, to the centre 10-ft. strip of 20 by 20 ft. plot of seaside bent [*A. alba*], about 7 per cent. of which was seriously injured by dollar spot, 2 gals. water containing 1 in 5,000 of the toxicant being used. A second treatment was given ten days later, by which time the spots had filled in so that the symptoms were barely perceptible. After another three weeks the treated turf was entirely free of infection.

ALLISON (J. L.) & CHAMBERLAIN (D. W.). **Distinguishing characteristics of some forage-grass diseases prevalent in the North Central States.**—*Circ. U.S. Dep. Agric.* 747, 16 pp., 16 figs., 1946.

This circular, illustrated with excellent photographs, brings together the available information regarding the more important diseases of pasture and forage crops in the north-central region of the United States, special emphasis being placed on the distinguishing characteristics of each disease. Of the diseases attacking perennial grasses, powdery mildew (*Erysiphe graminis*) and leaf rust (*Puccinia poae-sudeticae*) are common on Kentucky bluegrass (*Poa pratensis*) [*R.A.M.*, xxiv, p. 317]. The latter first appears in late spring as small, chlorotic spots developing into typical rust pustules, and is seasonal in its development, which is favoured by warm, humid weather. Stem [black] rust (*Puccinia graminis*) attacks cereal crops and several grasses, including Kentucky bluegrass. Stripe smut (*Ustilago striiformis*) [loc. cit.] is also common on Kentucky bluegrass. Another stripe smut (*Urocystis agropyri*) [ibid., xxiii, p. 57], which is less common on Kentucky bluegrass, can only be distinguished from the first by the spores which are formed in bolls with one to three fertile spores surrounded by a single layer of empty cells. Leaf spot (*Helminthosporium vagans*) [ibid., xxiv, p. 317] attacks only Kentucky bluegrass and occurs from late spring until autumn, attaining its greatest severity during midsummer, especially in hot, humid weather. Bacterial blight (*Pseudomonas coronafaciens* var. *atropurpurea*) [ibid., xxiv, p. 144] seriously attacks smooth brome grass (*Bromus inermis*) as well as several other grasses. The initial water-soaked areas turn purplish-black and often coalesce to cover the entire blade and sheath. As the blighted leaves wither and die, the lesions fade to a rusty brown. This disease is most destructive in mid-June and is favoured in its development by periods of hot, humid weather. Leaf spot (*Selenophoma bromigena*) [ibid., xxiv, p. 316] and brown spot (*Pyrenophora bromi*) [ibid., xxiv, p. 317] appear on smooth brome grass in early spring. Both scald (*Rhynchosporium secalis*) and ergot (*Claviceps purpurea*) are common on smooth brome grass and are favoured by periods of warm, moist weather. Brown stripe (*Scolecotrichum graminis*) [ibid., xxii, p. 483] attacks many grasses throughout the growing season. After browning, the leaf blades wither and die, dense, black conidiophores appearing between the leaf veins, the conidia being readily disseminated by wind and rain. Net blotch (*H. dictyoides*) [ibid., xiv, p. 515] attacks only meadow fescue (*Festuca elatior*), and occurs from late spring to autumn, attaining its greatest severity during midsummer. It is favoured by periods of hot, humid weather. The irregular, brownish lesions are marked with a delicate, netted pattern before the leaf eventually withers and dies. The conidia borne on the lesions or withered leaf tips are subhyaline to yellow, typically straight and three- to five-septate.

Of the diseases of annual grasses, all of which are favoured by warm, moist weather, bacterial spot (*Pseudomonas syringae*) [ibid., xxv, p. 41] attacks several grasses and is common on Sudan grass (*Sorghum*) [*sudanense*]. The initial water-soaked areas soon become dry, pale, and papery. The disease appears soon after seedling emergence and progresses throughout the growing period until all the leaves are affected. Bacterial stripe (*P. andropogoni*) is also common on Sudan grass and to a lesser degree on other grasses. The initial long, narrow, irregular leaf stripes soon dry and are covered with a dry exudate, the leaves more seriously affected becoming withered. The disease appears about midsummer and continues until plant maturity. Leaf blight (*H. turcicum*) [ibid., vi, p. 547] attacks maize and sorghum seriously in some areas of the United States and is destructive on Sudan grass [ibid., xxii, p. 383] in the north-central region. The foliage typically appears blighted or scalded, the symptoms appearing over a whole field within a few days. Conidia are produced in abundance on the lesions. The blight appears about midsummer and continues until plant maturity. Anthracnose (*Colletotrichum graminicola*) [ibid., xix, p. 602] attacks several grasses and is common on Sudan grass. Initial symptoms appear on the basal leaves as small, necrotic eye spots, each containing a visible black body. These are filled with conidia and, being open, are readily subject to secondary infection. The disease may eventually affect all the leaves which wither and die after individual lesions have coalesced. Anthracnose appears about midsummer and develops rapidly until plant maturity. An illustration is given of non-parasitic foliage disorders to which Sudan grass is especially prone. There is also a short review in general terms of the control measures for the diseases.

ROGERS (H. T.). **Iron deficiency of Crimson Clover on a calcareous soil and method of diagnosis.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 638–639, 2 figs., 1947.

Crimson clover (*Trifolium incarnatum*) was sown as a winter legume for grazing on calcareous Houston clay at the Black Belt Substation, Marion, Alabama, in the autumn of 1945, a 0–14–10 fertilizer being applied at the rate of 400 lb. per acre. The stand soon developed acute chlorosis. In order to diagnose the deficiency, specimens of the clover and soil were treated in the greenhouse with various combinations of nitrogen, boron, copper, iron, magnesium, manganese, and molybdenum. The only successful treatment consisted of a 0·1 per cent. ferrous sulphate spray, applied to the plants every three to four days. The compound failed to correct the iron deficiency symptoms when used as a soil amendment, indicating precipitation of the element in an unavailable form. Ammonium nitrate sprays intensified the chlorosis and retarded the maturity of the plants.

WILSIE (C. P.) & HUGHES (H. D.). **Development of early maturing wilt-resistant strains of Korean Lespedeza.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 615–622, 1 fig., 1947.

In 1942, replicated trials were instituted at the Iowa Agricultural Experiment Station to determine the reaction to wilt (*Phytomonas lespedezae*) [*R.A.M.*, xix, p. 543], relative maturity, and forage and seed yields of a number of promising selections of *Lespedeza stipulacea*. By 1944 three strains with satisfactory records in respect of disease resistance and early maturity were deemed to be ready for increase and distribution under the designations of Iowa 6, Iowa 39, and Iowa 48. The wilt-resistance indices (five-year average of field observations) for these three strains, in a scale of ascending susceptibility from 1 to 9, were 2·1, 2, and 2·5, respectively, as against 4·2 and 7·1 for Iowa 81 and Early Korean 19604, respectively. Some 5,000 lb. seed of Iowa 6 was available by the autumn of 1946, and it is being intensively propagated in the southern counties of the State to ensure plentiful supplies for 1948. A beginning has also been made with the increase of 39 and 48.

WILSON (M. C.). **Inheritance of resistance in Alfalfa to bacterial wilt.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 570–583, 1 fig., 3 graphs, 1947.

Data are presented from the writer's studies in California demonstrating that the resistance of lucerne to bacterial wilt (*Corynebacterium insidiosum*) [*R.A.M.*, xxvi, p. 398] can be resolved into terms of separate genes. Three or possibly four partially dominant genes for different degrees of resistance were segregated, of which one, P, appears to confer sufficient protection against the disease to be of value in the breeding of resistant plants. Homozygous P produced 72 per cent. healthy, 20 per cent. intermediate, and 8 per cent. severely infected plants, the corresponding figures for the susceptible California Common variety being 2, 7, and 91 per cent., respectively. Clones from individual plants showed that a single genotype might vary from healthy to severely diseased even under fairly uniform conditions. The inoculation of clones consisting of five to ten plants is a promising method of identifying self-sterile F_2 or back-cross plants as resistant or susceptible.

BREMER (H.). **Beobachtungen an Holzpflanzen im Steppenklima von Ankara.** [Observations on woody plants in the steppe climate of Ankara.]—*Rev. Fac. Sci. Univ. Istanbul*, Sér. B, xii, 1, pp. 9–34, 1 pl., 1947. [Turkish summary.]

Fruit-growers in the Ankara district of Turkey, relying overmuch on the recognized resistance of apricots to drought, tend to neglect essential cultural precautions in the orchard, with the result that die-back or 'apoplexy' is prevalent [cf. *R.A.M.*, xiv, p. 215]. Another trouble incidental to the 'steppe' climate is chlorosis, which is particularly severe on *Robinia pseud-acacia, Acer negundo, Catalpa bignonioides*, poplar (*Populus nigra*), and roses, while other susceptible species include *Thuja orientalis, Salix alba*, pear, apple, quince, peach, and plum. They are mostly ill adapted to the local environment by reason of their small, scattered stomata, retarding the transpiration of water. Other adverse factors besides the inadequate water supply are the predominantly alkaline soils and exposure to sunlight of excessive intensity.

ATKINSON (J. D.). **A note on crinkle in New Zealand Apples.**—*N.Z. J. Sci. Tech.*, A, xxviii, 5, pp. 332–334, 1 fig., 1947.

Crinkle, a physiological disorder of apples, appeared for the first time in New Zealand during the 1945–6 season [cf. *R.A.M.*, xiv, p. 592]. It is characterized by external depressions, generally at the calyx end, with an underlying area of light brown, necrotic tissue, of spongy texture and split up by numerous cavities, seldom extending more than 10 mm. into the flesh. The disease was reported from Auckland, Hawke's Bay, and Nelson, affecting the Winesap, Rome Beauty, and Sturmer varieties, respectively.

McAlpine regarded crinkle as a 'confluent form' of bitter pit (Bitter pit investigations: first progress report, 1912). Carne and Martin, studying the condition in the southern half of Australia and Tasmania [*R.A.M.*, xiv, p. 242], claimed that water core was an essential phase in its development and that high temperatures were the primary cause. In New Zealand, too, high temperatures, coupled with drought, appear to be a decisive factor in the etiology of crinkle. Fisher *et al.* in the United States [ibid., xi, p. 55] and Ware in England (*Gdnrs' Chron.*, xcii, pp. 287–288, 1932) also observed the favouring influence of heat on the disease.

COMPTON (O. C.), GRANVILLE (W. C.), BOYNTON (D.), & PHILLIPS (E. S.). **Color standards for McIntosh Apple leaves.**—*Bull. Cornell agric. Exp. Sta.* 824, 824A, 15 pp., 5 graphs, 2 col. charts, 1946.

The seven colour standards presented in this bulletin have been developed for measuring the nitrogen content of McIntosh apple leaves during July, the month

when the nitrogen content is changing the least. One leaf is picked from the median part of each of 10 to 12 shoots which are distributed uniformly around the outside of the tree, and are compared with the colour standards for each of which a corresponding nitrogen percentage on a dry weight basis is given. Values below 2·1 per cent. in July indicate nitrogen deficiency.

Pieniazek (S. A.), Christopher (E. P.), & McElroy (L. A.). **Further data on the control of storage scald of Apples by means of carbon dioxide.**—*Proc. Amer. Soc. hort. Sci.*, xlviii, pp. 81–88, 1946.

At the Rhode Island Agricultural Experiment Station in 1945–6, storage scald of apples was controlled by a few days' exposure of freshly harvested fruit to high concentrations of carbon dioxide at 32° F. [*R.A.M.*, xxv, pp. 1, 121], the most satisfactory results being obtained by a five-day treatment at 50 per cent. The delayed ripening of the fruit consequent on the application of carbon dioxide would prolong the storage period.

Baldwin and McIntosh apples maintained under the conditions described developed corky pockets of brown tissue near the core, but no adverse effects were observed on Cortland, Rhode Island Greening, Northern Spy, Stark, Delicious, Gravenstein, Winter Banana, Wealthy, or Jonathan. The general use of carbon dioxide cannot, however, be recommended until safe limits of effective concentrations can be defined and better methods of gas dispersal developed.

Promising results were also obtained with Bartlett pears.

Whittaker (E. C.). **The common storage of Granny Smith Apples.**—*Agric. Gaz. N.S.W.*, lviii, 6, pp. 303, 312, 1947.

Experiments carried out at Batlow and Orange, New South Wales, during the past few years have proved that Granny Smith apples [*R.A.M.*, xxvi, p. 229] can be held at ordinary cool storage temperature either unwrapped or plain wrapped until early July without any superficial scald [loc. cit.] developing. These trials also showed that fruit could be held until early August with hardly any expectation of scald development. Fruit so treated and removed from store in August, wrapped in oiled wraps, and returned to store until December showed only light superficial scald, even though the fruit was held at atmospheric temperature for a fortnight. It is suggested that if after about two weeks in common storage Granny Smiths be placed in cool store, unwrapped and unpacked and held until July before grading, sizing, and oil-wrapping prior to returning to cool store, many complaints of excessive wastage due to over-maturity disorders in late-marketed apples would be avoided.

Sinha (S.). **On decay of certain fruits in storage.**—*Proc. Indian Acad. Sci.*, Sect. B, xxiv, 4, pp. 198–205, 1946.

This is an amplified account of the writer's studies at Lucknow on the fungal spoilage of mango, apple, orange, and other fruits, a note on which has already appeared [*R.A.M.*, xxiii, p. 347].

Fikry (A.). **Water-table effects. V. Peach functional disorder.**—*Bull. Minist. Agric., Egypt*, 245, 42 pp., 19 pl., 1 graph, 1947.

The writer has already shown [*R.A.M.*, xvi, p. 755] that stone fruit trees in Egypt are adversely affected by the high subsoil water-table. In the present paper a comprehensive, tabulated account is given of studies carried out from 1935 to 1938 on the relation of this factor to a functional disorder stated to be the main pathological problem of the peach tree in the country. It induces a generally unthrifty condition, progressive debility, substantial yield reductions, and culminates in the death of the trees. The losses from this source amount annually to

thousands of pounds, and the large-scale eradication of the diseased stands has necessitated the importation of large quantities of peaches to augment the inadequate home-grown crop. The area devoted to peach-growing has diminished considerably owing to this disorder.

Chemical analyses of the soil and subsoil water revealed no toxic substances that might be responsible for the ill health of the trees. In years of normal floods *Prunus davidiana* shows a fair degree of resistance to the functional disorder, especially in comparison with the highly susceptible Baladi. There was no significant difference between the six scions used in the tests in respect of their reaction to the disease. Trees grown in the lower terraces were more subject to infection by rust [*Puccinia pruni-spinosae*] and shot hole [*Clasterosporium carpophilum*] than those situated on the higher levels, the incidence of infection on all scion varieties being essentially identical. The attacks increased in direct correlation with the rise of the subsoil water-table during the inundation period. The yield was considerably reduced in the low lands. Suggestions for the control of the trouble include the laying down of drains not less than 1 m. in depth; the maintenance of a low water-table not more than 1 m. below soil surface during the Nile flood in normal years; the use of resistant (*Prunus davidiana*) rootstocks; and a general survey of contour heights of localities above sea-level to determine suitable sites for peach-growing.

CARLSON (R. F.). **Treatment of Peach seed with fungicides for increased germination and improved stand of Peach seedlings in the nursery.**—*Proc. Amer. Soc. hort. Sci.*, xlviii, pp. 105–113, 1 fig., 1946.

Of the six commercial fungicides applied to peach seed and whole pits of the Lovell, 'Natural', and Salwey varieties, either as dusts or solutions (20 hours' soaking or 30 minutes' immersion under partial vacuum) at the New York Agricultural Experiment Station, fermate and spergon (1 to 3 lb. per 100 gals.) were the most effective from the standpoint of increased germination, freedom from [unspecified] fungal contamination, and improvement in stand. Arasan, ceresan, semesan, and zerlate gave moderately satisfactory results. In one test the average germination of treated and untreated Lovell seed was 43 and 18 per cent., respectively, and of Salwey 86 and 43 per cent., respectively. The treatment of partially germinated seed resulted in a decreased stand as compared with dormant. Treatment of the pits with aqueous solutions under partial vacuum was less successful than soaking in these experiments.

RANGEL (J. F.). **A calda bordaleza afeta as plantas?** [Does Bordeaux mixture affect plants?]—*Bol. fitossan. Minist. Agric., Rio de J.*, ii, 1, pp. 9–16; 2, pp. 115–127, 1945. [Received August, 1947.]

Many of the 74 papers comprised in the author's survey and discussion of the available information on the beneficial and detrimental effects of Bordeaux mixture on plants have already been noticed in this *Review*.

Test tube dilution technique for use with the slide-germination method of evaluating protective fungicides.—*Phytopathology*, xxxvii, 5, pp. 354–356, 1947.

Full directions are given for the application of the test-tube dilution technique, an elaboration of one previously developed [*R.A.M.*, xx, p. 543], in conjunction with the standard slide-germination method of the committee on standardization of fungicidal tests of the American Phytopathological Society [ibid., xxii, p. 489].

The method is eminently suitable for preliminary tests of new fungicides. Omitting refinements the procedure is essentially as follows: solutions of the chemical to be tested are prepared in concentrations of 10,000, 1,000, 100, 10, and 1 p.p.m. and further diluted in the manner prescribed. To a spore suspension of the test fungus at a concentration of 500,000 spores per ml. an equal volume of spore

stimulant solution (e.g., orange juice or potassium citrate plus sucrose, which insure a high and relatively stable germination percentage in the controls) is added at a concentration ten times that finally desired. Samples of the mixture, each 0·5 ml., are then pipetted into each test tube containing 2 ml. of the chemical undergoing test. Two drops from each test tube of spores and chemical are pipetted on to the left-hand side of a glass slide in a moist chamber, the right-hand side being reserved for tests with a second fungus. Germination counts are made 20 to 24 hours later.

Standardized spray nomenclature. The American Phytopathological Society Committee on Standardization of Fungicidal Tests.—*Phytopathology*, xxxvii, 5, pp. 357–358, 1947.

With the co-operation of plant pathologists, entomologists, and horticulturists in the various pertinent regions of the United States, a scheme of standardized spray nomenclature has been drawn up, and is here presented, in which the terms employed are believed to express the best general and current usage. They relate to dosage, with examples of some standard liquid mixtures and dusts, and to the times of treatment of (1) apples and pears, (2) peach, plum, apricot, and almond, (3) cherry, and (4) quince, each term being accompanied by a definition.

Weaver (W. E.) & Whaley (W. M.). **Organic fungicides. I. The preparation of some α-bromoacetamides.**—*J. Amer. chem. Soc.*, lxix, 3, pp. 515–516, 1947.

Twenty-three α-bromoacetamides, of which 20 are new compounds, have been prepared at the Naval Research Laboratory, Washington, D.C., preliminary to appraisal of their fungicidal activity. A general method for the preparation of amides from acid halides in ethylene dichloride is given.

Virgin (W. J.) & Maloit (Jean C.). **The use of triethylene glycol vapor as an aid in the control of air-borne contaminants.**—Abs. in *Phytopathology*, xxxvii, 5, p. 365, 1947.

Triethylene glycol vapour is stated to have proved very efficient in the elimination of air-borne contaminants in a pathological laboratory without adverse effects on the worker. A beaker containing 100 c.c. of the compound placed on a low Bunsen burner flame will fumigate a room of 7,000 cu. ft. in about 20 minutes, using 40 to 50 c.c. liquid. The vapour rises to the ceiling and gradually settles down to the floor, carrying with it most of the organisms floating in the air. Five minutes' exposure of agar plates before and after fumigation showed a considerable reduction in the number of atmospheric contaminants in the latter series.

Westerdijk (Johanna). **On the cultivation of fungi in pure culture.**—*Antonie van Leeuwenhoek J. Microbiol. Serol.*, xii (*Jubilee Volume Albert J. Kluyver*), pp. 223–231, 1947.

The history of fungal and bacterial culture is briefly reviewed, followed by a summary of 40 years' experience of culturing fungi (yeasts excluded) at the Centraalbureau voor Schimmelcultures, Baarn. Results have shown that widely different media should be used in succession for any one species, rich media alternating with poor ones, dry with moist, and complex with simpler ones. Carbohydrate concentration is generally too high. The author prefers media containing 2 to 3 per cent. sugar which restricts autolysis and acid formation. A pH range between 3·5 and 7 has less influence on most fungi than might be expected. In general, a neutral reaction is advisable and the view that most fungi are acidophilous is incorrect; even plant parasites, such as *Nectria* spp., may prefer extracts with pH 7·5. Actinomycetes prefer an alkaline medium.

Synthetic solutions are unsuitable for continuous cultivations. Juices from cherries, plums, tomatoes, and other fruits are preferable and primarily suitable

for preliminary isolations, as they have a low pH (3 to 4), which generally prevents the development of bacteria. Cherry juice is the best; most of the wood parasites thrive on it, as well as the organisms causing leaf spots and different forms of anthracnose (*Septoria*, *Cercospora*, *Phoma*, and *Ascochyta* spp.), which prefer media of low concentration to which no sugar should be added.

In some cases glycerol is a good source of carbon, e.g., for parasitic Actinomycetes, being added to starch-containing media, e.g., potato plugs. Virulent plant parasites, such as *Venturia* and *Claviceps* spp., thrive better on asparagine as a nitrogen source than on nitrates or ammonia compounds.

Change of temperature gives good results, e.g., change from higher to lower temperatures may induce fruiting in the Basidiomycetes. A moderately low room temperature is best generally, but sometimes higher temperatures are advisable, for dermatophytes, thermophilous fungi, *Aspergillus* spp., and Actinomycetes. *Penicillium* [*Carpenteles*] perithecia also often develop at these levels.

A minimum humidity of 7 per cent. is necessary. Neon light sometimes favours spore production. It is certain that each medium and all the environmental factors act in a definite way on each organism. Oval spores may become almost circular in agar, while others may decrease in size; walls may swell.

When possible, transfers should be made from sporulating mycelium, since fluffy aerial mycelium generally produces only sterile growth. In some instances (e.g., Basidiomycetes) large pieces of medium should be transferred with the fungus, because spores of many species do not germinate easily and the hyphae are sensitive to the high temperature of the needle. Some species require to be transferred every two months, especially those that thrive on readily drying media. Oomycetes should be transferred monthly and the Chytridiaceae more often.

SKERMAN (V. B. D.). **Simple techniques for the preparation of mould mounts.**—*Aust. J. exp. Biol. med. Sci.*, xxiv, 4, pp. 319–320, 3 figs., 1946.

The organism should be grown on Czapek-Dox agar, and a drop of a mixture of 75 parts ether and 25 alcohol discharged over the area from which the preparation is to be taken. After partial evaporation a drop of a solution of 75 ml. ether, 25 ml. ethyl alcohol, and 10 gm. celloidin should be placed with a 4-mm. loop within the moistened area. The celloidin will dry in one to three minutes as a thin film in which the mycelium is embedded. When sufficiently firm the film may be transferred to a slide with a pair of forceps.

The film should be taken from an area where the mycelium is not too dense. Pre-treatment with the ether-alcohol mixture prevents the inclusion of air bubbles in the celloidin. The film should be transferred to a clean slide and mounted under a cover-slip in lactophenol blue. After a few minutes the preparation may be examined without further treatment, or the film may be washed and mounted in clear lactophenol. Where the mycelium is too dense for this method, it should be teased out prior to staining after dissolution of the celloidin with the ether-alcohol mixture, preferably on a hot plate with a surface temperature of 45° to 50° C.

Preparations suitable for photographic purposes may be obtained by ten minutes' immersion of the film in lactophenol blue, washing with water, immersion in warm (45°) alcohol until the stain no longer runs freely, transference to a clean slide, removal of the celloidin with the ether-alcohol solvent, teasing, and mounting in clear lactophenol.

Proceedings of the Society for General Microbiology.—*J. gen. Microbiol.*, i, 1, pp. i–vii, 1947.

At the Society's fourth general meeting in December, 1946, papers on the virulence of bacteria, fungi, and viruses in plants, protozoa, and the higher animals were the subject of a symposium entitled 'The nature of virulence'.

In a paper on virulence of bacteria in plants [*R.A.M.*, xxvi, p. 288] Mrs. DAGNY OXFORD points out that bacterial plant pathogens are confined to the two genera *Bacterium* and *Pseudomonas*, which are free-living, heterotrophic, gram-negative, non-sporing micro-organisms, and this fact indicates that the plant host is much more efficient than the animal in withstanding bacterial infection. Plant tissues are invaded by bacteria chiefly through wounds, insect bites, or abrasions, humidity being the most important environmental factor. Ability to invade is only one aspect of virulence; communicability, the power of becoming established in the host under natural conditions, requires more attention. A study of the pectolytic enzymes might throw light on the action of the bacteria which break down tissues and cause necroses, wilts, and cankers. Protective use might be made of the fact that many pathogenic pseudomonads produce a levan from sucrose. Wormald [ibid., xiii, p. 710] has contributed much information on the host range of these pathogens and information from the various lines of approach should be collated.

J. T. DUNCAN, in his paper on the virulence of fungi in animals [ibid., xxii, p. 306], concludes that, interpreted in the restricted sense of infectivity and invasive power, virulence seems to be largely a matter of morphological and physiological adaptability to parasitic life in animal tissues.

K. M. SMITH, in his paper on the virulence of viruses in plants, attempts to define virulence and discusses whether it is ever an intrinsic property of a virus or merely a host-parasite relationship, quoting examples of various viruses and their host relationships.

[The summary of E. GÄUMANN's contribution on the virulence of fungi in plants is not included.]

RENNERFELT (E.). **Några undersökningar över luftens halt av svampsporer.** [Some investigations on the fungus spore content of the air.]—*Svensk bot. Tidskr.*, xli, 2, pp. 283–294, 3 graphs, 1947. [English summary.]

In 1946 the fungus spore content of the outdoor air at the Experiment Station near Stockholm was investigated. The spores were trapped in 9-cm. Petri dishes exposed fortnightly for one to two hours in the winter months and for 15 to 30 minutes during the remainder of the year. Of the 1,572 colonies thus obtained, principally from July to September, 810 (51·5 per cent.) were blueing fungi, 313 (19·9 per cent.) moulds, and 449 (28·6 per cent.) yeasts. *Cladosporium herbarum* was the most frequent of the blue-staining organisms and constituted 33·1 per cent. of the total number of fungi isolated; it was followed by *Pullularia pullulans*, [*R.A.M.*, xxvi, p. 368], *C. effusum* (the agent of pecan scab in the United States) [ibid., viii, p. 114 *et passim*], *Alternaria* spp., *Phoma* spp., and miscellaneous, representing 4·1, 2·8, 0·5, and 0·6 per cent., respectively, of the total. *Penicillium* spp. were the predominant moulds (7·4 per cent. of all the fungi isolated), *Aspergillus* spp. (mostly *A. niger*) being less prevalent (2·4 per cent.), while *Mucor*, *Cephalosporium*, *Trichoderma*, *Trichothecium*, and other species were rarely detected. *Torulopsis* and *Rhodotorula* spp. were the most common yeasts, representing 18·6 and 6·8 per cent., respectively, of the total number of isolates.

Björkman's analyses of the fungus spore content of the air in a saw-mill timber yard, summarized in the present paper, have already been reported [ibid., xxvi, p. 322].

Counts of the spores in the air of a room at the Forest Research Institute, made concurrently with the outdoor experiments, revealed a much lower content. *P.* spp. were the most abundant (200 out of 540 colonies or 37 per cent.), followed by *Cladosporium herbarum* (122 or 22·6), while other species present included *Torulopsis* (37 or 6·8) and *Pullularia pullulans* (34 or 6·3).

Areas vulnerable to mildew attack.—*Amer. Dyest. Reptr*, xxxvi, 5, p. 129, 1 map, 1947.

Mildew and rot, generally assumed to be a problem only in the semi-tropical southern States of the American Union, actually attack textiles, paper, &c. [see next abstracts] throughout the country, the cost to the public of the damage thus sustained being conservatively estimated at over $100,000,000 per annum. The accompanying map, prepared by Givaudan-Delawanne, Inc., a chemical firm actively engaged on mildew and mildew-proofing research, shows the areas vulnerable to mould infection during an average July.

Humidity is the key factor in the development of fungal spoilage, which may occur at a temperature as low as 45° F. provided humidity ranges from 75 per cent. upwards. Vertical lines on the map mark areas where the humidity exceeds 80 per cent. (dangerous), dots denote a range of 60 to 80 per cent. (vulnerable), and white sections indicate relative safety associated with less than 60 per cent. humidity. Critical areas in the south where high humidity combines with temperatures above 80° are shown by means of horizontal lines.

DEAN (J. D.) & WORNER (R. K.). **The degradation of untreated Cotton fabrics exposed to weather in a subtropical climate.**—*Amer. Dyest. Reptr*, xxxvi, 15, pp. 405–410, 423–424, 2 figs., 5 graphs, 1947.

Changes in breaking strength and fluidity were the chief criteria applied in the assessment of degradation suffered by cotton fabrics in a series of tests from 1942 to 1946 involving exposure to the weather in the subtropical climate of New Orleans [cf. preceding and next abstracts]. The grey samples were found to be much more severely attacked by mildew, with consequent loss of breaking strength, than the kierboiled or bleached, without any significant increase in the fluidity values. To confirm this effect of purely biological degradation, samples of grey and bleached print cloths were inoculated with pure cultures of the cellulose-destroying fungus, *Metarrhizium glutinosum* [*Myrothecium verrucaria*: *R.A.M.*, xxvi, p. 474], and incubated until they had lost some 90 per cent. of their original breaking strength. In a parallel test grey osnaburg was buried in biologically active soil for six days, by which time it had undergone a breaking-strength loss of 93 per cent. No appreciable fluidity increase was observed in any of these extensively degraded samples.

In another experiment, designed to ascertain the effect of seasonally influenced biological action on the strength and fluidity of weathered cotton, three replicate samples each of grey and bleached sheeting were exposed from January to March and identical sets from June to August, these two periods representing the minimum and maximum, respectively, of biological activity. After the three months of winter exposure both the grey and bleached samples had lost about 20 per cent. of their initial strength; there was, however, a larger increase of fluidity (from 3 to 16 rhes) in the latter than in the former (2 to 10). At this time the grey cloth showed slight but unmistakable symptoms of mildew in the form of scattered discolorations of pinhead size on the lower surface, whereas the bleached samples were free from visible infection. As a result of the summer exposure strength losses rose to 41 and 52 per cent., respectively, in the bleached and grey samples, the latter being heavily spotted with mildew while the former showed only a slight discoloration, chiefly from the growth of a greenish alga-like organism.

The different types of degradation affecting the grey and bleached samples exposed during these two seasons were in general agreement with the results obtained in the multiple-exposure sets of grey duck and osnaburg and grey twill. After three months of exposure made with starting dates between November and January, six samples of duck and osnaburg (considered as one fabric) showed an average strength loss of 12·5 per cent. and an average fluidity of 10 rhes, the

corresponding figures for eight similar samples exposed for three months starting between May and August being 35 per cent. and 9 rhes, respectively. Two bleached twills showed an average strength loss of 37 per cent. and a fluidity of 21 rhes in the winter exposures, with corresponding figures for the summer of 52 per cent. and 25 rhes, respectively.

Combining data secured from replicate samples exposed for equal periods at different seasons, it was shown that an unbleached 10-oz. cotton duck may be expected to lose on an average 40 to 45 per cent. of its breaking strength after six months' exposure and 60 to 65 per cent. after a year, these reductions being accompanied by fluidity increases up to 16 and 22 rhes, respectively. Unbleached lighter-weight fabrics show somewhat greater strength losses with about the same fluidity increases. Bleached cloth sustains slightly heavier average strength reductions than grey of equal weight, and its degradation is characterized by definitely higher fluidity values at points of equal strength loss.

SIU (R. G. H.). **Fundamental aspects of the prevention of the microbiological degradation of Cotton textiles.**—*Amer. Dyest. Reptr*, xxxvi, 12, pp. 320–323, 1947.

At the Quartermaster Corps Biological Laboratories, Philadelphia, about 200 out of over 10,000 cultures of micro-organisms isolated from deteriorated cotton fabrics have been shown to possess cellulolytic properties. It is doubtful, however, whether all are of great importance under field conditions. For instance, there is as yet no available evidence of outdoor activity by *Myrothecium verrucaria* [see preceding abstract], perhaps the most strongly cellulolytic of all the organisms tested in the laboratory. The moulds predominating in the open include *Memnoniella echinata* and *Chaetomium globosum* [see next abstracts]. The hyphae penetrate the fibre wall into the lumen, where they proliferate and digest the fibre outwards, unlike bacteria, which adhere to the outer surface and pit their way inwards. The organisms secrete cellulose-digesting enzymes of two classes, namely, (1) cellulase, converting cellulose into cellobiose, and (2) cellobiase, transforming cellobiose into glucose.

There are four general lines of approach to the development of preventive methods, i.e., (1) physical exclusion of the organisms from contact with the cellulose molecule, as illustrated by the resistance of resin-impregnated cloth, (2) cell toxicants (fungicides), (3) specific enzyme inhibitors (existing to-day only as a theoretic possibility), and (4) chemical modification of the cellulose molecules on the surface of the fibres into resistant derivatives, which appears to offer great promise of future exploitation.

ILLMAN (W. J.) & WEATHERBURN (MURIEL W.). **Factors affecting the development of mould on Cotton fabrics and related materials.**—*Amer. Dyest. Reptr*, xxxvi, 13, pp. 343–344, 369–372, 5 figs., 2 graphs, 1947.

A study under the auspices of the National Research Council of Canada on the influence of temperature and humidity conditions on mould (including *Memnoniella echinata*, *Stachybotrys atra*, *Metarrhizium glutinosum* [*Myrothecium verrucaria*], and *Chaetomium globosum*) [cf. preceding and next abstracts] growth on various textiles, and on packaging, electric insulation, and miscellaneous materials [*R.A.M.*, xxvi, p. 253] showed that at 86° F. no development occurred at 60 per cent. relative humidity, scarcely any at 70 per cent., and little at 80, but it increased steadily from 85 to 100 per cent. Growth on cotton duck, both untreated and copper naphthenate-treated, was accelerated by the presence of free water. The removal of constituents of unbleached cotton duck by leaching in water (but not in solvents) reduced the incidence of rot. The addition of certain nutrient solutions, viz., salts, dextrose, and lucerne, separately or combined, to the water-leached fabric did not promote mould growth to the same extent as did the untreated cotton duck.

JONES (S. C.). **Immunization of fabrics from moths, rot and mildew.**—*Indian Text. J.*, lvi, 671, pp. 1021–1023, 1946.

The available information concerning the control of rot and mildew (*Metarrhizium* sp., *Chaetomium globosum*, &c.) on fabrics is summarized [see preceding abstracts]. Proofing agents that have undergone practical testing for this purpose include the copper and zinc naphthenates, salicylanilide, and a number of phenolic and mercury compounds; notes are given on their performance and any special advantages or drawbacks connected with their use. A list of other preparations still in the laboratory stage of experimentation is also given and methods for the application and testing of fungicides are outlined.

BENIGNUS (P. G.). **Mildew problems of interest to paint, varnish and lacquer manufacturers.**—*Paint Oil Chem. Rev.*, cx, 7, pp. 10, 30, 34, 1947.

The presence of food materials being essential for mould growth, the use of non-nutrients in the formulation of finishes for paint, lacquer, and varnish is indicated. The following plasticizers applied as protective coatings have been found relatively resistant to fungal infection [cf. *R.A.M.*, xxv, p. 571]: chlorinated phenols (marketed by the Monsanto Chemical Company under the trade name of aroclors), chlorinated paraffin, trinitro-butyl citrate, triethyl citrate, triethylene glycol di-(2-ethyl hexoate), triethylene glycol di-(2-ethyl butyrate), polyethylene glycol, most of the common phosphate and phthalate plasticizers, diethyl succinate, dinitrobutyl tartrate, many sulphonamides and sulphonates, triphenyl guanidine, diamyl naphthalene, and biphenyl with a number of its derivatives. Definitely non-resistant materials include glyceryl triacetate, lauric and oleic acid derivatives, sebacates, ricinoleates, and stearates. Nutrients for moulds are further supplied by coatings incorporating linseed, cottonseed, tall, fish, oiticica, and soy-bean oils, and alkyd or phenolic resins modified with these oils. More resistant are tung, pine, most coal tar, petroleum, and some sulphonated oils.

The chemicals most widely used for the preparation of 'fungicidal' lacquers are organo-mercury compounds, chlorinated phenols, salicylanilide [cf. ibid., xxv, p. 174], and zinc dimethyl dithiocarbamate. Excellent results have recently been obtained with 1 to 2·5 per cent. copper 8-quinolinolate [ibid., xvi, p. 67] (Monsanto's milmer 1) in the manufacture of fungistatic lacquer coatings for use on electronic equipment, which is at present being thoroughly tested by the military authorities under actual service conditions. Wood oil-modified para-phenyl-phenol-formaldehyde air-drying varnishes appear to be quite resistant to mould invasion. Phenolic resin varnishes have been observed to deactivate certain fungicides, notably mercury compounds. Where surface fungicidal activity is required in this type of varnish, 5 to 10 per cent. pentachlorophenol has been found most satisfactory. The same compound or salicylanilide at a comparable dosage may be applied to alkyd resin-base varnishes modified with long oil. Used at a concentration of 1 to 2 per cent., copper 8-quinolinolate or pentachlorophenol have imparted the necessary fungicidal properties to wax compositions and sealing compounds under tropical conditions.

In laboratory experiments ponderosa pine panels were coated with casein paint containing various percentages of sodium pentachlorophenate, and 24 hours after the final application they were sprayed with a spore suspension of moulds isolated from mildewed panels. They were then placed in a humidity chamber, again sprayed with the fungal suspension, the chamber was sealed, and the specimens left for 35 days at 26° C. The control panels included in the test showed heavy mildew growth in a few days, whereas those treated with 0·5 per cent. sodium pentachlorophenate were completely protected. During the war large quantities of casein-base water-dispersible and -emulsifiable paints used for camouflage were

effectively preserved with 2 per cent. santobrite [ibid., xxii, p. 136] or santophen 20 (Monsanto sodium pentachlorophenate and pentachlorophenol, respectively).

The iron oxides commonly used in paints are known to stimulate mould growth, whereas pigments derived from zinc, lead, cadmium, aluminium, chromium, titanium, calcium, antimony, barium, and copper are usually non-nutrients and in some cases fungistatic. For instance, white paints containing a high proportion of zinc oxide are fairly resistant to mildew, while copper and cadmium are used in some applications specifically for their mould-inhibiting properties. When oil paints are used in humid areas it is usually found that the necessary resistance to mildew can be assured only by the addition of toxicants [cf. ibid., xxv, p. 177]. The results of accelerated laboratory and outdoor paint panel exposure tests indicate that certain mercurial compounds at concentrations of 0·2 to 0·5 per cent. are very effective for this purpose, but only for relatively brief periods. In preliminary trials pentachlorophenol and its sodium salt (2 to 5 per cent.) and 3 to 5 per cent. zinc pentachlorophenate have given encouraging results.

In paint-on-wood systems both components should be suitably protected against mildew. Brush, spray, and dip treatments with 5 per cent. pentachlorophenol, dissolved in petroleum oil fractions and containing small amounts of auxiliary solvents and resinous bondings agents, such as aroclor 5460, are widely used for the disinfection of wood.

HOYT (R. E.) & LEVINE (M. G.). **A method for determining sensitivity to penicillin and streptomycin.**—*Science*, cvi, 2747, p. 171, 1 fig., 1947.

To overcome the difficulties incidental to the laborious existing methods of determining sensitivity to penicillin and streptomycin, the antibiotics have been incorporated into compressed tablets $\frac{7}{32}$ in. in diameter and 60 mg. each in weight. The most satisfactory base was found to consist of dried and screened dicalcium phosphate, starch, and gum acacia, to which the calculated amount of the dried antibiotic is added and thoroughly mixed. Tablets containing 1, 0·5, and 0·1 Oxford units penicillin and 1, 0·1, and 0·01 mg. streptomycin, respectively, have been prepared. Susceptibility of the test organism is shown by a clear zone round the tablet on agar cultures. Contaminated material can be tested directly without preliminary subculture, contaminations being immaterial.

WILKINS (W. H.). **Investigations into the production of bacteriostatic substances by fungi. Preliminary examination of the fifth 100 species, all Basidiomycetes, mostly of the wood-destroying type.**—*Brit. J. exp. Path.*, xxvii, pp. 140–142, 1946.

Further investigations [cf. *R.A.M.*, xxvi, pp. 24, 258] in which 100 wood-destroying Basidiomycetes were tested for anti-bacterial properties showed the following to be strongly positive against *Bacterium coli* and *Staphylococcus aureus*: *Coniophora cerebella* [*C. puteana*], *Cyathus striatus*, *Daedalea quercina*, *Fomes annosus*, *Lenzites sepiaria*, *Merulius lacrymans*, *M. tremellosus*, *Polyporus betulinus*, *P. eucalyptorum*, *Poria ferruginea-fusca*, *P. vaillantii*, and *P. xantha*; a further 20 per cent. were weakly positive.

PINTO-LOPES (J.). **Variation of the antibiotic power of the Hymenomycetes with the different stages of their life-cycle.**—*Portug. Acta biol.*, Sér. A, i, 4, pp. 409–412, 1946.

Evidence is presented and discussed in support of the author's view that the antibiotic properties of Hymenomycetes [*R.A.M.*, xxvi, pp. 258, 350, *et passim*] vary with the different phases in their life-cycles, represented by mono- or polysporous mycelia, as the case may be [ibid., xxi, p. 301]. It follows, therefore, that both stages should be investigated before the species is pronounced to be

lacking in bacteriostatic activity. Other phenomena to be borne in mind as potential factors in the production of anti-bacterial substances are sexual barriers [ibid., xiv, p. 645], illegitimate combinations (between theoretically incompatible mycelial groups) [ibid., xxvi, p. 313], and the so-called 'geographical races', which are presumed to originate in physiological divergences.

Rode (L. J.), Foster (J. W.), & Schuhardt (V. T.). **Penicillin production by a thermophilic fungus.**—*J. Bact.*, liii, 5, pp. 565–566, 1947.

A fungus tentatively identified as *Malbranchea* [*Actinomyces*] *pulchella* [*R.A.M.*, xx, p. 302] has been found to produce penicillin at 52° C., at potencies ranging from 1: 64 to 1: 128 against *Staphylococcus aureus*.

Kelner (A.), Kocholaty (W.), Junowicz-Kocholaty (Renate), & Morton (H. E.). **Two antibiotics produced by Actinomyces isolated from soil.**—Abs. in *J. Bact.*, li, 5, pp. 591–592, 1946.

Two antibiotics active against a number of Gram-negative and Gram-positive organisms were obtained at the University of Pennsylvania, School of Medicine, from soil-inhabiting species of *Actinomyces* designated A–10 and A–105, of which the former is tentatively identified a member of the *A. lavendulae* [*R.A.M.*, xxiv, p. 463] group and the latter as a variant of *A. erythreus* or a new species. Chemical purification resulted [see next abstract] in a 40- to 50-fold increase in efficiency calculated on a dry-weight basis.

Junowicz-Kocholaty (Renate) & Kocholaty (W.). **Two antibiotics (lavendulin and actinorubin) produced by two strains of Actinomyces. II. Purification and isolation.**—*J. biol. Chem.*, clxviii, 2, pp. 757–764, 1947.

The two antibiotic principles isolated from soil-inhabiting *Actinomyces* spp. [see preceding abstract] have been isolated as crystalline helianthates and named lavendulin and actinorubin. Only tentative formulae for their composition can be established at the present juncture. Their chemical characteristics and reactions and anti-bacterial spectra present some analogies with streptothricin.

Junowicz-Kocholaty (Renate), Kocholaty (W.), & Kelner (A.). **Sulfactin, a new antibiotic substance produced by a soil Actinomyces.**—*J. biol. Chem.*, clxviii, 2, pp. 765–769, 1 fig., 1947.

From cultures of an *Actinomyces*, possibly a variant of *A. roseus* or a new species, a new antibiotic substance, designated sulfactin, has been obtained in crystalline form. In Dr. H. E. Morton's experiments at the University of Pennsylvania, School of Medicine, 1 ml. of the crude culture was non-toxic to mice, and the purified substance has a favourable ratio of therapeutic to toxic dose.

Barrett (J. T.). **Observations on the root endophyte, Rhizophagus, in culture.**—Abs. in *Phytopathology*, xxxvii, 5, pp. 359–360, 1947.

None of the many previous records of the occurrence and investigation of the *Rhizophagus* type of endophyte [*R.A.M.*, xxiii, p. 402] in the roots of various plants presented information on the successful establishment of the organism in culture, though in a few cases slight growth was made. The writer obtained a *Rhizophagus* culture from garden pea roots [? in California] by placing a fragment of boiled hemp seed directly on a few hyphae attached to a piece of diseased root in water. New growth appeared in a few days on the fragment of seed, which was transferred to a Petri dish containing sterile tap water with a fresh half of boiled hemp seed submerged in the centre. Within ten days the typical vesicular mycelium of the endophyte had covered the bottom of the dish. The organism was then

established on water agar plus a modicum of water from autoclaved hemp seed and other media, thus becoming available, for the first time, for intensive biological and taxonomic study.

LARGE (E. C.) & BEER (W. J.). **Field trials of copper fungicides for the control of Potato blight. III. Low-copper fungicides.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 406–413, 2 graphs, 1946.

In further field trials on the control of potato blight (*Phytophthora infestans*) by means of copper fungicides [cf. *R.A.M.*, xxv, p. 470] carried out on trial plots at Beaford, north Devon, and Galmpton, south Devon, in 1945, the following sprays were tested comparatively against both early and late infection: Bordeaux mixture (4–5–40) freshly prepared from granulated copper sulphate and hydrated lime (0·25 per cent. copper), the same at half-strength and quarter, ialine colloidal copper compound, a colloidal suspension of basic copper carbonate in paste form (5 lb. per 100 gals.), bouisol, a liquid colloidal suspension of copper oxychloride (4·17–100), perenox, a dispersible preparation of yellow cuprous oxide in powder form (1·25–100), yellow cuprocide, a similar preparation (0·75–100), fungex, a liquid cuprammonium compound (5·7 pt. per 100 gals.), the last five all containing 0·063 per cent. copper, dithane 14, a solution containing 3 lb. disodium ethylene bis-dithio-carbamate per U.S. gal. used at 4 pt. plus 1 lb. zinc sulphate and ½ lb. hydrated lime per 100 gals. to introduce a light flocculum into the spray fluid and improve adhesion, the zinc sulphate and lime were also used apart from the dithane to test for possible fungicidal effect of their addition to it, and lime-sulphur (1 in 50). All the copper fungicides were tested with and without an adhesive of the calcium caseinate-rosin soap type.

Precautions were taken to avoid confusion of the observations by concurrent mineral deficiency and virus disorders, and the treatments were compared according to three criteria: direct foliage protection, spray retention, and indirect effect on yield. Two applications were given at Galmpton and three at Beaford.

In both trials all the proprietary copper fungicides gave less efficient foliage protection than did 1 per cent. Bordeaux mixture and all showed inferior resistance to washing off by rain both when used alone and with a spreader and sticker. Also, none of them gave any significantly better protection than 0·25 per cent. Bordeaux mixture, which with thorough spraying and timely application afforded sufficient protection for the production of almost a full crop.

It would seem that in horticultural practice, where spraying can be carried out thoroughly at well-chosen times, satisfactory control of potato blight will result from only a few applications of almost any copper fungicide with copper dosage as low as that of 0·25 per cent. Bordeaux mixture. In agricultural practice, however, it would seem preferable to select a copper funcigide with the greatest possible resistance to washing off by rain, and to use it at 0·25 per cent. copper content.

Dithane 14 was more effective at 1 in 200 than lime-sulphur at 1 in 50, and this was not due to the zinc sulphate and lime, which, used alone, had no effect. Three applications of dithane 14, however, were inferior in protecting power 0·25 per cent. Bordeaux, and it would appear that weekly applications of dithane would be necessary to secure control.

BLACK (W.) & HAIGH (J. G.). **Strains of Potato blight in Scotland.**—*Scot. J. Agric.*, xxvii, 1, pp. 49–50, 1947.

Three strains of *Phytophthora infestans* [*R.A.M.*, xxvi, p. 428] have been isolated by the Scottish Plant Breeding Station. The common strain, A, occurs in the field on commercial varieties of potatoes; strains B and C have appeared only on trial plots of seedling selections resistant to strain A, and they are, therefore, more virulent than A. Since all British potatoes of commercial origin are suscep-

tible to the common strain, more detailed examination is necessary to show whether strains B and C occur in the field or are confined to experimental material.

Test leaves, the reactions of which to the three strains were known, were inoculated with conidial suspensions from 37 samples of blight-infested material from 25 Scottish counties, and two samples from the trial plots. The varieties providing the test leaves were 1258a (19) and 882 (5), immune from all three strains of *P. infestans*, 887a (34), immune from A and B, susceptible to C; 655 (43), immune from A and C, susceptible to B; and King Edward, susceptible to all. In all 39 tests King Edward leaves were attacked. The other leaves remained unaffected except for one test on 655 (43), which was infected by material from a seedling known to be susceptible to B.

It appears, therefore, that only strain A occurs in field and that the more virulent strains arise by the modification of the A strain to suit a new gene complex. This modification probably requires several seasons to become effective under natural conditions. *Solanum demissum* has so far resisted the attacks of the most virulent strains of *P. infestans*.

Koch de Bertelli (Lucia). **La Peronospora o mildiu de la Papa. (Phytophthora infestans (Mont.) de Bary).** [Potato *Peronospora* or mildew (*Phytophthora infestans* (Mont.) de Bary).]—*Publ. mens. Direcc. Agron. Urug.* 87, 16 pp., 6 col. figs., 1946.

First observed in Uruguay by A. M. Guarch, in 1914 and for the second time in 1922, potato late blight (*Phytophthora infestans*) did not reappear until the spring of 1938, when it assumed a virulent form in the environs of Montevideo. The next outbreak occurred towards midsummer of 1941, a more severe one was recorded in the autumn of 1943, while in the latter half of March and again in October and early November, 1944, the pathogen renewed its attacks with great intensity. During the latter period tomatoes were also mildly affected. A wild potato, *Solanum boergerii*, was heavily infected by *P. infestans* in 1944. The fungus developed on early crops in September, 1945.

The symptomatology of the disease is described, Sorauer's account of the perpetuation of the fungus through the tubers (Handbuch der Pflanzenkrankheiten, II, 1921) is translated into Spanish, the problems relating to breeding for resistance to late blight are discussed, the available information on the pathogen and the factors affecting it in Uruguay is summarized, and full directions are given for control by sanitation and spraying with Bordeaux mixture.

Tottingham (W. E.), Nagy (R.), Ross (A. F.), Marek (J. W.), & Clagett (C. O.). **Blackening indices of Potatoes grown under various conditions of field culture.** —*J. agric. Res.*, lxxiv, 5–6, pp. 145–164, 1 graph, 1947.

The influence of climatic and cultural conditions and potato varieties on the blackening of potatoes after boiling [*R.A.M.*, xxvi, p. 261 and next abstract] was studied in a number of tests over a period of nine years at the Wisconsin Agricultural Experiment Station. They showed no single factor or combination of factors to be uniformly responsible for blackening; rather, they emphasized the complexity of the factors governing this response of the tubers.

Potassium, especially when used in large quantities, sometimes decreased blackening noticeably. Otherwise there was no substantial evidence that mineral nutrition affects the colour, but climatic factors evidently have some influence. The data were not, however, sufficiently consistent to permit a precise definition of the conditions that cause discoloration. Blackening was prevented by exposing susceptible tubers to 100° F. for three to four days.

Chippewa, Triumph, and Sebago potatoes rarely cooked black regardless of the conditions under which they were produced; on the other hand, Rural New Yorker, Irish Cobbler, and some other varieties frequently blackened.

LEWIS (W. R.) & DOTY (P. M.). **Partial characterization of a compound involved in the blackening of white Potatoes.**—*J. Amer. chem. Soc.*, lxix, 3, pp. 521–523, 1947.

A colourless, fluorescent precursor of the pigment causing a greyish or black discoloration of potatoes on cooking [*R.A.M.*, xxv, p. 317 and preceding abstract] has been isolated at the Indiana Agricultural Experiment Station. It is unsaturated and contains a carbohydrate and a nitrogenous group, the latter being probably an amino-acid or a peptide, but neither tyrosine nor tryptophane. The absorption curve of the precursor attains a maximum at 2,800 Å.

PEKLO (J.). **Z boje proti infekčním chorobám Bramborů: strupovitosti, vločkovitosti a plísni Bramborové.** [On the control of the Potato fungi; powdery scab, black scurf and stem canker, and blight.]—*Zem. Arch.*, xxxii, 9–10, pp. 505–534, 2 plates, 1941. [German summary. Received May, 1947.]

The tests described in this paper were conducted during 1932–1939 in the potato-growing region of Czechoslovakia, the hills of Českomoravská vysočina. Two susceptible potato varieties were used, the table Zločen and the starch Škrobáky. The fields were infested with *Spongospora subterranea*; *Phytophthora infestans* and *Rhizoctonia* [*Corticium*] *solani* both developed severely. The scabs of *S. subterranea* may become breeding places of the last-named organism. These secondary diseases were usually more severe than the original powdery scab. *Actinomyces scabies* was also found on the powdery scab affected tubers and some of the experiments indicated that *S. subterranea* promoted an attack by the former, which was followed by virulent infection by *C. solani*.

One part of the field where the control experiments took place was predisposed to *S. subterranea* by its chemical and physical qualities; the other part was free from it. The ordinary mineral fertilizers had no effect on the control of the disease. This was achieved effectively by ammonium sulphocyanate (12 quintals per ha.) which destroyed at the same time *P. infestans*, *C. solani*, and *A. scabies*, the yield being 77·8 q. per ha. Some damage was caused to the plants by this fertilizer and its price is unfortunately high. The result shows the mechanical relationship of all these potato diseases to powdery scab.

C. solani was controlled to a great extent by hot formalin disinfection of the tubers (0·3 per cent. at 50° C. for 2½ minutes). An experiment in 1939 showed an increase in yield of 10 per cent. by this method. In a test, pure-culture basidiospores isolated from the *Hypochnus* [*C.*] stage were used in different combinations for the infection of three potato varieties. They showed the marked genetic variability of the fungus and this accounts for the difficulty sometimes experienced in its control.

THOMAS (W. D.). **Growth and variation of six physiologic races of Actinomyces scabies on different culture media.**—*Phytopathology*, xxxvii, 5, pp. 319–331, 1947.

Six physiologic races of *Actinomyces scabies* from various types of scab pustules on Irish Cobbler potatoes [*R.A.M.*, xvii, p. 766] at the Minnesota Agricultural Experiment Station differed conspicuously in pathogenicity on the varieties Arnica, Earlaine, and Hindenburg and seven selections [cf. ibid., xxvi, p. 260].

The best sources of carbon for the growth of these races were sucrose, cellulose, inulin, and maltose. Nitrogen and phosphorus generally promoted their develop-

ment, while potash tended to retard it. Spergon and thiosan (1 in 1,000) showed some degree of specificity in their action on the several races, the former totally inhibiting the more pathogenic 11 and 39 and permitting only scanty development by 49, while the latter suppressed 39 and severely limited the growth of 11, 48, and 49; mycelial production in the other races was not materially impaired by the compounds. None of the races grew in the presence of semesan bel, corona PD-7, or yellow mercuric oxide (all at 1 in 1,000), but No. 47 survived the addition to the medium of mercuric chloride at 1 in 10,000 [ibid., xiii, p. 466]. *Trichoderma lignorum* [*T. viride*] extract arrested the growth of races 11 and 49 and *Penicillium digitatum* extract inhibited 48, both also acting adversely on the other races. All the races grew poorly in the presence of a filtrate of *Melanconium putredinis*, *Aspergillus niger* substantially reduced mycelial production in 11, 39, 46, and 47, while only 11 withstood the detrimental effects of *Rhizoctonia* [*Corticium*] *solani* extract. Scanty growth was made by all the races on media containing clay-loam extracts, peat favoured 46 and 47, while 11, 39, 46, and 49 developed better on sand.

The production of variants was considerably influenced by differences in the source of carbon, mannose, starch, and sucrose promoting sector development in all the races while cellulose discouraged it. Race 48 produced two sectors of variant type 8, characterized by an ochraceous-salmon mycelium, no aerial growth, and smooth topography, on *A. niger* extract medium, while 49 formed one each on media incorporating filtrates of *P. digitatum* and *C. solani*. Race 49 was variable on peat and clay loam extracts, while 11, ordinarily the most stable of all, gave rise to nine sectors on sand. When the six races were reisolated from the tubers on the termination of the pathogenicity tests, those inoculated with 11, 47, and 49 gave rise to variant type 4, which colours the medium salmon-orange and makes a dark gull-grey aerial growth, the colonies being smooth. The more pathogenic races 11 and 39 were the most stable, while the tendency of the others to form sectors of the same type may point to a close affinity between them.

KRAMER (M.). **A 'sarna prateada' da Batatinha.** [Silver scurf of Potato.]—*Biológico*, viii, 3, pp. 83–86, 2 pl., 1942. [Received July, 1947.]

Silver scurf of potato (*Spondylocladium atrovirens*), which formerly attracted little attention in São Paulo, Brazil, has assumed considerable importance of recent years, especially in the regions of Cotia and São João de Bôa Vista. Not only may the fungus itself be responsible for heavy losses, but it paves the way for the infection of the tubers by secondary parasites. Promising results in the control of the disease have been obtained at one of the State experiment stations by $1\frac{1}{2}$ hours' immersion of the tubers in 1 per cent. mercuric chloride. Other precautions should include tri- to quadrennial crop rotation; storage in a well-ventilated room with due regard to correct temperature and humidity; timely harvesting (as soon as the tubers reach maturity) to forestall the development of a large number of lesions before storage; planting in dry soils on elevated sites; and the rejection for seed of severely infected tubers, the use of those with less extensive lesions being permissible after treatment.

SHERF (A. F.), PAGE (R. M.), TULLIS (E. C.), & MORGAN (T. L.). **Studies on factors affecting the infectivity of Helminthosporium oryzae.**—*Phytopathology*, xxxvii, 5, pp. 281–290, 1 fig., 1947.

Previous studies on the relation of environmental factors to the pathogenicity of the agent of brown spot of rice (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*: see next abstract] have been carried out on oriental collections of the fungus which may represent a different physiologic race from that occurring in the United

States [*R.A.M.*, vii, p. 55]. The wide distribution and severity of the disease were considered to justify a further investigation of this aspect of its etiology.

Methods are described for the production of inoculum from the vegetative mycelium or from conidia of the imperfect state, *H. oryzae*, for experimental use in the greenhouse and field. The mycelium was grown in 4-l. pyrex bottles on 3 l. of a sterilized solution consisting of 10 per cent. (by volume) blackstrap molasses and 0·5 per cent. peptone per bottle. The bottles were inoculated with 2 ml. of an aqueous suspension of conidia and incubated at 27° to 31° C. for six days, during which aeration was affected by the introduction of sterile air at 1,500 ml. per minute. The mycelium was filtered and the filter cake broken up and dried at 40° for 24 hours, the resulting product being ground in a Wiley mill to yield a dust. The conidial inoculum was produced on steamed, sterilized oats and rye. Fernbach flasks containing 300 gm. of these seeds were inoculated with an aqueous suspension of conidia and incubated at 22° to 24° in the dark for 14 days. Three to five 200-ml. portions of water were added singly to the flasks, vigorously shaken, and the resultant conidial suspension strained through wire gauze into cylinders after each addition. After standing overnight at 8° the supernatant liquid was decanted from the cylinders and the concentrated conidia collected in a funnel on coarse filter paper. The filter cake was broken up and dried in a steam oven for 24 hours at 40°. Some 3 to 4 gm. conidia of 96 to 97 per cent. germinability were thus obtained from each 300-gm. sample of dry substratum. Both the conidial and mycelial dust were used with a limestone filler. Generally speaking, the conidia were five to ten times more efficient than the mycelium in the initiation of infection. Disease-free seed of the susceptible Onsen and Butte varieties was readily obtainable for experimental purposes; for other varieties Nisikado and Miyake's hot-water treatment (*Ber. Ōhara Inst. landw. Forsch.*, i, pp. 543–555) was applied.

The maintenance of the plants under conditions of high humidity prior to inoculation failed to predispose them to infection [cf. *R.A.M.*, xvii, p. 343] but promoted its development owing to the presence of free water on the leaves. A 10-hour period of abundant moisture after inoculation was requisite for optimum infection at 22° [cf. ibid., xi, p. 536]. Rain reduced the incidence of brown spot by washing the inoculum from the foliage. The optimum temperature for infection ranged from 20° to 25°, with a maximum at 30° [loc. cit.]. In the field more severe infection resulted from inoculations between 8.30 and 9.30 p.m. than in the early morning or at noon. The plants were susceptible to foliar infection at all stages of growth, and none of the 20 varieties used in greenhouse tests showed appreciable differences in resistance to brown spot. The conidia remained viable for 28 days on the leaf under favourable greenhouse conditions.

Page (R. M.), Sherf (A. F.), & Morgan (T. L.). **The effect of temperature and relative humidity on the longevity of the conidia of Helminthosporium oryzae.**—*Mycologia*, xxxix, 2, pp. 158–164, 4 graphs, 1947.

Helminthosporium oryzae [*Ophiobolus miyabeanus*: see preceding abstract] has been shown to possess extensive longevity in culture [*R.A.M.*, ii, p. 230]. These experiments conducted at Camp Detrick, Maryland, during 1944 were to determine first the effect of temperature, then of controlled temperature and relative humidity combined, on the longevity of the conidia grown on moistened, sterilized oats. The results showed that viability was retained best at low temperatures at all relative humidities; 81 per cent. of the conidia were still viable after storage for 100 days at 2° C. and only 6 per cent. at 31°. The relative humidity during storage had more influence on longevity than temperature alone; for example, at 20 per cent. relative humidity and 31° the conidia survived for six months whereas at 95 per cent. and 31° they lost their viability after one month. It does not seem

likely, therefore, that the conidia would survive for long either in the warm, moist climates of the rice growing regions or in the winter under field conditions.

STARR (M. P.). **The causal agent of bacterial root and stem disease of Guayule.**—*Phytopathology*, xxxvii, 5, pp. 291–300, 1 fig., 1947.

The name proposed for the bacterium responsible for a stem and root disease of guayule (*Parthenium argentatum*) in California [see preceding abstract] is *Erwinia carotovora* f. sp. *parthenii* n.f.sp. The morphology, staining, reactions, and cultural characters of the guayule pathogen on various media are fully described. It differs from *E. carotovora* only in some cultural properties, e.g., in the production of indole, the peptonization of milk, the failure to grow on sterilized potato, and its ability to attack guayule. Inoculation experiments on guayule with *E. carotovora* from other hosts, as well as with *E. oleraceae* from cauliflower, *E. rhapontici* from rhubarb, and *E. solanisapra* and *E. atroseptica* [*E. phytophthora*] from potato gave negative results, whereas the plants infected with *E. carotovora* f. sp. *parthenii* rapidly succumbed to the typical stem and root rot.

CAMPBELL (W. A.). **A bacterial root and stem disease of Guayule.**—*Phytopathology*, xxxvii, 5, pp. 271–277, 1 fig., 1947.

The pathogenicity of the *Erwinia* responsible for the bacterial rot of guayule (*Parthenium argentatum*) [*E. carotovora* f. sp. *parthenii*: see preceding abstract] already reported from California [*R.A.M.*, xxvi, p. 169] was demonstrated by greenhouse inoculation experiments. The average times required for the complete wilting of infected plants at 75°, 80°, and 85° F. were 7, 7, and 8 days, respectively. At 70°, 89°, and 98° the appearance of the symptoms was delayed and below 60° the wounds healed without infection.

The bacteria were shown by histological examination of the diseased tissues to be confined to the cortical cells, which rapidly disintegrated under the influence of the pathogen, permitting the ready separation of the bark from the stems.

TCHAN (Y. S.). **Microbiologie du sol; une nouvelle technique de microscopie directe.** [Microbiology of the soil; a new method of direct microscopy.]—*Ann. Inst. Pasteur*, lxxiii, 7, pp. 695–696, 1947.

The following simple method has proved very serviceable in the examination of soil samples. A portion of the soil to be tested is placed in a Petri dish and after incubation at 28° C. the top layer is transferred to a flamed slide, and stained with phenicated erythrosine, which results in good differentiation of bacterial and fungal colonies, including Actinomycetes.

ERIKSON (DAGNY). **Differentation of the vegetative and sporogenous phases of the Actinomycetes. 1. The lipid nature of the outer wall of the aerial mycelium. 2. Factors affecting the development of the aerial mycelium.**—*J. gen. Microbiol.*, i, 1, pp. 39–52, 3 plates, 1947.

It appears that it is the presence of lipid substances in the outer walls of the aerial mycelium of Actinomycetes which gives it a characteristic dry, powdery appearance and causes difficulty in wetting the constituent spores. These substances, which are probably glyceride in nature, can be removed by fat solvents and wetting agents or destroyed by alkali. The lipid-containing aerial mycelium is readily distinguished from the vegetative mycelium by staining with Sudan IV in ethanol.

Soil Actinomycetes which consistently produce aerial spores in surface colonies when first isolated on soil extract agar retain this property when maintained in

sterile soil or when grown in a water agar medium on washed suspensions of living or dead common soil bacteria. Aerial growth in soil is best initiated by aeration at constant composition, moisture content, and temperature. The quantity of the inoculum and whether it is sporogenous or vegetative, and, within a broad range, the pH of the soil, are minor factors. Dehydration is very important for stimulating sporulation once growth is well established. The types of growth of different Actinomycete strains in natural and sterilized soils and in a synthetic soil containing 250 p.p.m. of nitrogen as nitrate are similar and generally uncharacteristic of their species.

Singh (B. N.). **Studies on soil Acrasieae. 1. Distribution of species of Dictyostelium in soils of Great Britain and the effect of bacteria on their development.**—*J. gen. Microbiol.*, i, 1, pp. 11–21, 1 pl., 1 fig., 1947.

An isolation method using silica jelly revealed the common occurrence of *Dictyostelium* spp. in arable soils. Apparently only *D. mucoroides* and another *D.* sp. are commonly found in the soils of England, Wales, and Scotland although from the last-named only a few samples have so far been examined. No correlation between the pH of the soil and the distribution of *D.* spp. was found in soils ranging from pH 4·3 to 7·8. Their presence in the classical plots at Rothamsted, where no fertilizers or only artificial ones had been added for over 100 years, disproves the earlier belief that species of *Dictyostelium* are dung organisms.

Kreibohm de la Vega (G. A.). **Situación actual de las variedades de Caña de Azúcar con relación a la plaga del 'carbón'. Susceptibilidad demostrada por las variedades cultivadas en la Estación Experimental Agrícola.** [Actual situation of Sugar-Cane varieties in relation to the 'smut' disease. Susceptibility shown by the varieties cultivated at the Agricultural Experiment Station.]—*Bol. Estac. exp. agríc. Tucumán* 61, 40 pp., 3 graphs, 1947.

The present position as regards the reactions to sugar-cane smut [*Ustilago scitaminea*] of the varieties grown at the Tucumán (Argentina) Agricultural Experimental Station [*R.A.M.*, xxv, p. 524] is fully described and the pertinent statistical data set out in tabular form. Of 39 varieties recommended in 1944 for the rehabilitation of diseased plantations, seven (Tuc. 630, 1238, 1296, 2605, 2704; P.O.J. 2878 and 2961) are still smut-free, while the remainder have contracted infection of varying degrees of severity.

[McMartin (A.).] **Experiment Station notes. New Cane varieties. Control of disease.**—*S. Afr. Sug. J.*, xxxi, 6, pp. 373–374, 1947.

Very few cases of sugar-cane mosaic have as yet been found by the South African Government inspectors in their new season's survey in the Mount Edgecombe district of Natal [*R.A.M.*, xxvi, p. 420], but at Umzinto the disease is still widespread, almost every field examined containing a number of infected canes (less than 1 to 17 per cent.). Some stools of N: Co. 310, which were formerly infected by the virus, have completely recovered: a similar observation was previously made in connexion with N: Co. 79, while diseased stools of Co. 301 may produce some healthy shoots.

Smut [*Ustilago scitaminea*] appears to be still restricted to the Tongast area where it was originally detected [ibid., xxiv, p. 290]. The pathogen is reported to have been causing serious damage of late in Portuguese East Africa and Rhodesia. In the latter country all Co. 301 is affected and its propagation has been discontinued on Incomati Estates, largely on this account; the disease has further been noted on N: Co. 310.

Camp (W. H.), Rickett (H. W.), & Weatherby (C. A.). **International rules of botanical nomenclature.**—*Brittonia*, vi, 1, pp. 1–120, 1947.

This is an unofficial special edition of the Rules, including the changes made by the International Botanical Congress at Amsterdam in 1935 and an alphabetical index to conserved and rejected names of genera as well as those proposed for conservation or rejection. Since the official edition of the Rules included only the changes made at Cambridge in 1930, and for some years has been unobtainable, this new, complete edition will be useful to all botanists.

Kleineberger-Nobel (Emmy). **The life cycle of sporing Actinomyces as revealed by a study of their structure and septation.**—*J. gen. Microbiol.*, i, 1, pp. 22–32, 3 pl., 14 figs., 1947.

This is an interesting study of four sporing Actinomycetes [*R.A.M.*, xxiii, p. 119]: *Actinomyces gardneri, A. albosporeus, A. chromogenes, and A. madurae* [ibid., xxv, p. 185].

The spore contains a round chromatinic body and cytoplasm enclosed in a spore case and germinates by sprouting in succession one to three or rarely four tubules. The first ones are always slender and irregularly twisted and undulating, a feature often found in fungal hyphae but not in bacteria. The nuclear body of the spore divides into two structures, partition products of which enter the germination tubules. The primary mycelium develops further by stretching and sprouting accompanied by division of its small nuclear bodies found in all side branches. At first no transverse septa are formed but soon the whole primary mycelium is composed of compartments of different length divided from each other by delicate transverse septa. These septa can be demonstrated only by the tannic acid-crystal violet method. In older hyphae the septa are more widely spaced. The primary mycelia differ sharply from the secondary in that they never divide into single cells. When the young primary mycelium is well developed, agglomerations of hyphae appear in the form of skeins, networks, and scrolls, first at the centre of the colony and later at the periphery. Where two parts of one, or two different filaments touch each other, brightly staining new elements called 'initial cells' arise, which consist of dark nuclear bodies surrounded by cytoplasm and later enclosed by a cell wall. It is probable that at the point of contact of the filaments the contents of two cells fuse together so that the initial cell may be regarded as a fusion cell. This condensation of filaments is a constant feature of the four *Actinomyces* spp. so far examined.

The initial cells grow into the secondary mycelium by a process of sprouting and subdivision of cells. The secondary hyphae are composed of fairly long, cylindrical cells, each containing a deeply staining, cylindrical mass of nuclear material, and are subdivided by well-defined and easily demonstrable transverse septa. The hyphae, which are straight and less profusely branched than the primary ones, often break up into single cells, particularly in certain species and on certain media. These cells have exactly the same structure as those of the hyphae and are able either to grow out again into a new secondary mycelium or to form spores. Spore formation is preceded by division of the nuclear cylinders in the cells of the secondary mycelium. The products of this division are of definite shape and their arrangement seems to follow a regular pattern. Whereas the nuclear cylinders occupy a longitudinal position in the cells, the small, rod-like or dumb-bell structures derived from them lie across the cells, singly or more often in pairs, either parallel to one another or in V- or X-like configurations. Just as the cell of the secondary mycelium resembles the fusion cell of certain spore-bearing bacteria, so the small rod-like structures resemble the bacterial 'chromosomes'. During these nuclear changes new septa are formed subdividing the large compartments into smaller ones, each of which corresponds to a single spore.

Moesz (G. v.). **Fungi Hungariae. IV, Basidiomycetes—Pars 1, Uredineae, Finis.** [Fungi of Hungary. IV, Basidiomycetes—Part 1, Uredineae, Conclusion.]—*Ann. hist. nat. Mus. Hung.*, Pars bot., xxxv, pp. 73–87, 1942. [Received May, 1947.]

This final instalment of the author's critical studies on the Uredineae of Hungary [*R.A.M.*, xxvi, p. 80] is an index of hosts in alphabetical order of their botanical names.

Jørstad (I.). **Coccosporium aucupariae and Mastigosporium deschampsiae, two new Fungi Imperfecti.**—*Forh. VidenskSelsk. Krist.*, xix, 8, pp. 25–28, 2 figs., 1947.

Coccosporium aucupariae n. sp. forms on the bark of mountain ash (*Sorbus aucuparia*) twigs near Trondhjem, Norway, coal-black, pulvinate, hirsute, fragile, purely superficial coatings. It is characterized by erect, congested, fuscous, simple or branched, septate hyphae, 8 to 13·5 μ in diameter, giving rise to globose or irregularly ovoid, multicellular, deciduous conidia, 16 to 45 by 16 to 35·5 or up to 130 by 75 μ, which may either be pleurogenous and sessile or acrogenous on short branches simulating conidiophores or on long hyphae.

Deschampsia caespitosa in different parts of the country is parasitized by *Mastigosporium deschampsiae* n. sp., which forms elliptical, brown or dingy purple spots with paler centres on the leaves. Its conidia are hyaline, ellipsoid, rounded or sometimes tapering at the apex, measure 40 to 68 by 15·5 to 20 μ, and are furnished with 4 to 7 (mostly 6) septa.

Smith (A. H.). **North American species of Mycena.** xvii+521 pp., 99 pl., 56 figs. Univ. of Michigan Press (and Oxford Univ. Press), 1947. $6.00.

In this excellent monograph the author interprets *Mycena* in a rather broad sense and emphasizes microscopic characters in his taxonomic treatment. Notes are given on habitat, seasonal occurrence, field work, laboratory technique, chemical tests, etc. In the United States and Canada 218 species and 14 varieties are recognized, but only 19 species are included from tropical America since much more work is needed before tropical species can be evaluated. Notes are given on excluded and doubtful species, followed by a bibliography and an index.

Gadd (C. H.). **The collection of blistered leaves.**—*Tea Quart.*, xix, 1, pp. 17–20, 1947.

The author describes in popular terms the method of infection of tea leaves by spores of *Exobasidium vexans* [*R.A.M.*, xxvi, p. 358] adhering to their lower surfaces, and advances the theory that the disease arrived in Ceylon as spores carried through the air from South India. Although there is no proof to support this, the disease was undoubtedly rapidly distributed through the tea areas of Ceylon, even to Uva, by air currents. As sprays are impracticable except for use in nurseries it is suggested that in the plucking gardens the best method of control is to have short rounds with hard plucking of the young uninfected shoots. The old blisters will then die without much likelihood of re-infecting. Collection of blistered leaves cannot keep pace with the formation of new blisters, unless these are few and the weather conditions are unfavourable to the fungus, and is considered a waste of labour.

Tubbs (F. R.). **Blister blight.**—*Tea Quart.*, xix, 1, pp. 23–26, 1947.

This was a lecture delivered before the Nuwara Eliya Planters' Association on 15th May 1947, and deals with the subject of pruning, tipping, spraying, and

plucking of tea in Ceylon in relation to weather conditions when there is an outbreak of *Exobasidium vexans* [see preceding abstract]. It is recommended that the pruning programme should be adjusted so that bud-break occurs at the beginning of the dry period, pruning should be light, and pruned bushes should be tipped successionally as the shoots come up to the chosen level.

SCHACHMAN (H. K.). **Viscosity studies on the association of Tobacco mosaic virus.**—*J. Amer. chem. Soc.*, lxix, 8, pp. 1841–1846, 4 graphs, 1947.

Viscosity measurements on preparations of the rib grass [*Plantago lanceolata*] strain of the tobacco mosaic virus [*R.A.M.*, xxi, p. 227 *et passim*] from young diseased Turkish tobacco plants indicate that it possesses a high degree of resistance to aggregation as compared with the ordinary strain. One preparation contained very few aggregated particles after four years' storage in distilled water.

REITSMA (J.), SLOOF (W. C.), & THUNG (T. H.). **Frog-eye and barn spot on Tobacco leaves caused by Cercospora nicotianae Sacc. et Sydow.**—*Chron. Natur.*, ciii, 6, pp. 94–98, 4 figs., 1947.

From a comparison of the descriptions of frog eye and barn spot diseases of tobacco [*R.A.M.*, xi, pp. 129, 134; xv, p. 612] with the actual diseases the authors consider it would be justifiable to conclude that frog eye is caused by *Cercospora raciborskii* and barn spot by *C. nicotianae*. Their experiments showed, however, that the same fungus can produce both kinds of spots.

Leaves with typical frog eye spots were kept in a closed Petri-dish for three days. The yellowish-white centres gradually darkened, the margins becoming broader, darker, and more indefinite, thus closely resembling typical barn spots. On the first day conidia were observed which were broadened or swollen at the tip. They were never acute, even on the third day. The conidiophores on the first day were similar to those of *C. raciborskii* but much longer, 168 to 224 by 4·2 to 5·6 μ. After two days samples taken from the same spot showed conidiophores of the same size as those of *C. nicotianae*. On the third day, after the introduction of wet cotton-wool, the appearance of the fungus completely changed. The conidiophores had grown to 600 by 7 μ, raising the number of their septa to 12, 17, even to 22. The conidia had reached a maximum length of 200 μ and the septa increased to 12 to 16. They had lost the swollen appearance of their apices. Three groups of conidiophores could be distinguished: the first nearly 200 μ long with five, six, or seven septa, the second nearly 400 μ with 12 to 17, and the third up to 600 μ with 21 or 22.

These observations show that surrounding conditions affect the appearance of the fungus. Very moist conditions lead to the development of the form known as *C. nicotianae* within three days, whereas an increase of humidity after a period of dry weather will cause the development of the *C. raciborskii* form.

The authors conclude that the separation of the *Cercospora* fungus into two species cannot be maintained. The name *C. nicotianae* is retained for reasons of priority and in order to obtain a complete description of it the detailed description of *C. raciborskii* given by Solheim and Stevens [loc. cit.] must be added.

BAINES (R. C.). **Perennial Nightshade, a host for Corynebacterium michiganense.**—Abs. in *Phytopathology*, xxxvii, 5, p. 359, 1947.

A bacterium resembling *Corynebacterium michiganense* was isolated from stem cankers on perennial nightshade (*Solanum douglasii*) in a tomato field in southern California in 1944. Inoculation tests with the nightshade strain produced typical infection both on the same host and tomato, whereas an isolate from the latter was pathogenic to tomato only. The organism overwintered on *S. douglasii*.

TRUTER (SUSARAH J.). **Een voorlopig onderzoek naar de insterving van Alnus glutinosa [L.] Gaertner.** [A preliminary investigation on the die-back of *Alnus glutinosa* (L.) Gaertner.]—Thesis, Univ. Utrecht, 110 pp., 9 pl., 1 graph, 1 chart, 1947.

As in Denmark (E. Rostrup, Plantepatologi, Copenhagen, 1902), Belgium, and Germany [*R.A.M.*, xv, p. 540], alders in Holland suffer from die-back. Fructifications of the following fungi were found on the dead bark of trees in the van Heloma polder: *Valsa oxystoma*, *Pezicula cinnamomea* (DC.) Sacc., *Cryptospora suffusa* (Fr.) Tul., *Melanconium stromaticum* Cda, *Diaporthe alnea* Fuck., *Dendrophoma* sp., and *Phoma* sp. With the exception of *V. oxystoma*, they were also isolated from the cankers, together with *Mycosphaerella tulasnei* (*Cladosporium herbarum*) [ibid., xi, p. 310], *D. pulvis-pyrius* Sacc., and *Papularia sphaerosperma* [ibid., xvii, p. 558].

Besides trees with cankers, there are other cases of die-back associated with abnormal constriction, while yet another form of the disease is characterized by sparse foliation of the crowns and lateral branches. When the trees are cut down before the root-collar becomes involved, the stumps put out new, rapidly growing shoots, which are healthy at first but later die back from the tips.

The roots of alders with die-back are not as a rule discoloured, but those that are yield low percentages of various fungi, e.g., *Bispora* sp., *Leptosphaeria coniothyrium*, *Pezicula cinnamomea*, *Cylindrocarpon radicicola* [ibid., xxv, p. 215], *Myxosporium* sp., *Phoma dunorum* [ibid., xviii, p. 358], *P.* sp. (group 1), *Hypocrea rufa* (*Trichoderma viride*) [ibid., xviii, p. 761], and a sterile, undetermined fungus X. The last-named was also the chief occupant of the discoloured trunk and branch vessels in the early stages of die-back, but it was superseded later by a highly variable microflora, consisting for the most part of *Pezicula cinnamomea*, *Cryptospora suffusa*, *L. coniothyrium*, *Diaporthe alnea*, and *Phoma* sp. (group 1). Inoculation experiments on the roots, trunks, and branches of healthy alders up to 20 years old with a number of the above-mentioned fungi failed to reproduce the symptoms of the die-back observed in nature, but *Pezicula cinnamomea* and *D. alnea*, which caused strictly localized cortical infections on slowly growing and unthrifty trees, may be regarded as weak parasites. *Fusarium sporotrichoides* stimulated atypical callus formation. *C. suffusa* appeared to be purely saprophytic on the bark of diseased trees. Fungus X and the rest of the organisms tested, including *V. oxystoma*, gave negative or doubtful results.

It is concluded that fungi are in any case not solely responsible for the chronic die-back of alders. Chemical analyses of the polder soil have so far yielded no clue to the condition.

HAWBOLDT (L. S.). **Aspects of Yellow Birch dieback in Nova Scotia.**—*J. For.*, xlv, 6, pp. 414–422, 2 graphs, 1947.

The present paper summarizes the position to date concerning the die-back of yellow birch in Nova Scotia [*R.A.M.*, xxv, p. 375] and recommends salvage operations and light cuttings to improve the vigour of the stands. *Melanconium bicolor* is added to the list of fungi already reported as having been isolated from diseased trees. Evidence is presented in support of the view that other factors besides fungal and insect depredations are implicated in the decadence of the birches, possibly including an extended drought condition during the growing season between 1913 and 1938.

RAGGI (C. A.). **Nota sobre un interesante caso de parasitismo del Botrytis cinerea Pers. sobre Eucaliptus sps.** [Note on an interesting case of parasitism by *Botrytis cinerea* Pers. on *Eucalyptus* sp.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iii, 29, 11 pp., 6 figs., 1947.

Early in 1945 nursery seedlings of *Eucalyptus rostrata* were submitted for examination to the Institute of Plant Hygiene, Buenos Aires, on account of a die-

back originating with a delicate white efflorescence on the upper leaf surfaces which is gradually followed by the development of brown, necrotic, asymmetrical, diffuse spots in the foliar parenchyma and finally by the desiccation and shedding of the leaves. The lesions may extend in the form of vertical stripes to the stems, which are ultimately girdled, and sometimes the entire plant is destroyed. The fungus isolated from the diseased tissues on 1 per cent. dextrose agar was identified by Dr. H. N. Hansen as *Botrytis cinerea* [cf. *R.A.M.*, v, p. 395]. Inoculation experiments with a conidial suspension of the pathogen on *E. rostrata* and *E. tereticornis* resulted in the typical symptoms of the die-back observed on the former, whereas *E. macrorhyncha* proved to be resistant.

ALLEN (G. S.). **Mold free germination of coniferous seeds.**—*J. For.*, xlv, 1, p. 51, 1 diag., 1947.

At the Department of Forestry, University of British Columbia, the following procedure has proved effective in the mould-free germination of conifer seeds, especially of stratified Douglas fir (*Pseudotsuga taxifolia*) and grand fir (*Abies grandis*), which are particularly liable to fungal and bacterial contamination. Two enamel or glass trays are used, one slightly larger than the other. The smaller one is filled to within ¼ in. of the top with moist washed sand, which is covered with several thicknesses of paper towelling. Over the latter is spread a uniform layer of Du Bay semesan (30 per cent. hydroxymercurichlorophenol) at the rate of about one teaspoonful per sq. ft., on which is superimposed a final cover of paper towelling. The seed is washed thoroughly in a fine screen and spread over the surface of the paper. This pan is now placed within the larger one, the latter being kept filled with water during the germination period, and the seeds covered by a fine screen raised above the seed layer by means of its rigid sides about ½ in. in depth. Over the screen is laid a piece of doubled cheesecloth, its ends dipping into the water.

NORD (F. F.) & VITUCCI (J. C.). **On the mechanism of enzyme action. XXIX. The acetate metabolism of certain wood-destroying molds and the mechanism of wood decay.**—*Arch. Biochem., N.Y.*, xiv, 1–2, pp. 229–241, 2 graphs, 1947.

The action of the wood-destroying fungi, *Merulius confluens, M. niveus, M. tremellosus* [*R.A.M.*, viii, p. 3], and *Fomes annosus* on acetic, glycolic, lactic, pyruvic, succinic, fumaric, malic, dimethylsuccinic, and dimethylfumaric acids was investigated at Fordham University, New York. With the exception of *M. confluens,* the organisms were able to produce oxalic acid in the form of a salt from all the acids. They could utilize oxalic acid in the free state but not when present as a salt. The mechanism of acetate → oxalate transformation proceeds along the following channels: (1) acetic → succinic → fumaric → malic → oxalic acid; (2) acetic → glycolic → glycoxylic → oxalic acid. Cellulose from wood is degraded [cf. next abstract] according to the following phases through the operation of the fungi under observation: cellulose → glucose → ethyl alcohol → acetic acid → oxalic acid.

NORD (F. F.). & VITUCCI (J. C.). **On the mechanism of enzyme action. XXX. The formation of methyl-p-methoxylcinnamate by the action of Lentinus lepideus on glucose and xylose.**—*Arch. Biochem., N.Y.*, xiv, 1–2, pp. 243–247, 1947.

A crystalline product, methyl-*p*-methoxylcinnamate, is formed as a metabolite by *Lentinus lepideus* grown on Scots pine wood [*R.A.M.*, xix, p. 448] and also, in the writer's experiments, on a semi-synthetic glucose or xylose medium. These observations lend weight to the concept that the phase sequence of the decomposition of the cellulose of wood [cf. preceding and next abstracts] is initiated by an introductory hydrolysis of the substance by the fungus.

NORD (F. F.) & VITUCCI (J. C.). **Enzymatic hydrolysis of cellulose by Coniophora cerebella.**—*Nature, Lond.*, clx, 4060, p. 261, 1947.

During the course of the investigation of the enzymatic activities of wood-destroying moulds [see preceding abstracts] an attempt was made to depict the phase sequence of the degradation of the cellulosic fraction of wood. In tests with filter paper and surgical cotton, *Coniophora cerebella* [*C. puteana*] was found to degrade both forms of cellulose to oxalic acid. Evidence was obtained that a hydrolytic action was involved. Surgical cotton degraded by *C. puteana* for 60 days was examined at certain intervals, employing the analytical technique of Hiller and Pacsu (*Text. Res. J.*, xvi, p. 490, 1946). An increase in reducing power of the residual cellulose was observed as the oxalic-acid content increased.

It is suggested that the enzymatic degradation of cellulose effects a split of 1,4-glycosidic bonds rather than, or concomitant with, a split of semi-acetal linkages.

HARRINGTON (T.) & HICKSON (B.). **Chemical preservation reduces timber costs.**—*Int. Indust.*, xxviii, 3, pp. 137–140, 6 figs., 1947.

An interesting survey is given of the development of timber preservation from 1705 to the present day, with special reference to the large-scale operations carried on by Hickson's Timber Impregnation Co. (G. B.) Ltd. It comprises useful information on fungal decay, destruction by insects, methods of impregnation, available preservatives, and testing of preservatives.

GUSTAFSON (R. O.). **Forest fires, basal wounds and resulting damage to timber in an eastern Kentucky Area.**—*Bull. Ky agric. Exp. Sta.* 493, 3 figs., 2 graphs, 15 pp., 1946. [Received August, 1947.]

This study gives an account of forest fires in eastern Kentucky and the resulting damage. Fire wounds are caused and previous wounds enlarged, and the rot developing from these wounds entails losses up to 31 per cent. gross board volume. Frequency of open fire wounds seems to depend on past cutting practices, resistance to decay, thickness of bark, and rate of growth. Of the trees 5 in. in diameter and larger, 30 per cent. have an open basal wound. Conifers have fewer wounds than hardwoods, oaks, yellow poplar [*Liriodendron tulipifera*], and black walnut [*Juglans nigra*] being the least damaged of the hardwoods, while maple [*Acer*] and beech are the most severely injured. The repeated burning by 'light' surface fires causes very great damage to the stands, which become worthless, and prevents the establishment of new, healthy trees.

SMITH (F. G.), LINK (K. P.), & WALKER (J. C.). **Acidic and phenolic fractions of crucifer roots in relation to club-root.**—*J. agric. Res.*, lxxiv, 7–8, pp. 193–204, 1947.

Phenol and acid analyses by modified Folin and diazo techniques (*J. biol. Chem.*, xxiii, pp. 627–650, 1927; *Industr. Engng Chem.*, Analyt. Ed., xi, pp. 423–424, 1939), of fresh root tissues of the Purple Top Milan and Shogoin turnip varieties, resistant and susceptible, respectively, to club root (*Plasmodiophora brassicae*) did not confirm the suspected significance of the phenolic or acidic constituents of such tissues as factors in resistance to the disease [*R.A.M.*, xxvi, p. 370]. Using the so-called PT extraction and fractionation technique in small-scale tests of the 1940 crop of the same two varieties at the Wisconsin Agricultural Experiment Station, highly significant differences, correlating with resistance to club root, were noted in the phenol contents, titratable acidity, and toxicity of the tissues. However, further extensive applications of the same procedure to the 1941 crops of other crucifers of varying reaction to *P. brassicae*, and the elimination of the

hydrogen-ion influence on the toxicity tests, failed to reveal any clear-cut correlation between the phenolic or acidic tissue fractions and resistance to club root.

POUND (G. S.). **Diseases of Cabbage plants grown for seed in Western Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 475, 27 pp., 5 figs., 1946.

A full account is given of the results obtained in disease surveys carried out each summer and autumn from 1943 to 1945 in the Puget Sound area, and principally in Skagit County, Washington, where almost all the cabbage seed produced in the United States was grown before 1942, and where the average annual acreage planted to this crop amounted to approximately 1,000 to 1,200 acres. In addition, the area produces large acreages of turnip and swede. Seed is sown in early June and July, transplanting begins about 1st August, and the seed harvested during July and August of the following year, so the culture allows no cabbage-free period during which disease organisms can be destroyed. During the three years of the investigation, the surveys showed that cabbage mosaic [*R.A.M.*, xxv, p. 243] was the most destructive disease. In the summers of 1943, 1944, and 1945 the disease index (percentage of area infected correlated with severity) for this disease was, respectively, 67·5, 68·9, and 44·6, the corresponding figures for the autumn readings being 57·7, 29·4, and 15·8. Widespread infection in autumn resulted from the close vicinity of the seed beds to diseased seed fields. Up to 1944 the seed beds were located indiscriminately in relation to old seed fields. In late June, aphids increase heavily in seed fields and migrate to the seed beds. Infections in the plant beds often reached 60 to 80 per cent. Beginning with the 1944–5 crop, several seed beds were grown in isolation and approximately 60 per cent. of the transplants set for this crop came from these. The result was a marked drop in the mosaic disease index for the autumn of 1944 and the summer of 1945. Almost all the plants used for the next crop were grown in isolated areas, whereupon the index for the autumn of 1945 fell to 15·8.

Downy mildew (*Peronospora parasitica*) [loc. cit.] occurred in nearly 100 per cent. of the acreage and varied little in severity from year to year. The disease index was 47·4, 53·3, and 41·3 in the summers of the three years, respectively, and 32·8, 35·1, and 31·8 in the autumn readings. The summer of 1945 was much drier than the two earlier ones. The disease usually causes more serious losses in the seed than in the head stage. Fields kept under clean culture, properly staked and twined, were consistently less seriously affected than poorly kept fields.

Ring spot (*Mycosphaerella brassicicola*) [ibid., xxii, p. 335; xxiv, p. 42] showed a disease index of 38·8, 17·5, and 45·9 for the summer readings of the three years, respectively, and 3·2, 13·2, and 14·3 for the autumn readings in the same years. The wide variation in these figures was due to two primary factors, (1) the amount of inoculum left in old seed fields, and (2) initiation of early infections by rains in late summer and early autumn. In the summer of 1943 a very small seed acreage was harvested, and there was consequently little inoculum for the autumn of 1943, so the infection in that season was very slight; by the summer of 1944 every field showed infection, though the attack was not generally severe. The acreage harvested in 1944 was twice the normal size, with the result that sufficient inoculum was present to produce widespread infection in the autumn of 1944. Also, summer and early autumn rains were common in 1944; they led to infection immediately after transplanting and before the inoculum could be destroyed. Hence, the disease became rapidly and widely established in the autumn of 1944. Had the summer of 1945 not been exceptionally dry, the disease index would have been much higher for that season. The high index value in the autumn of 1945 was largely the result of poor crop sanitation. In every instance severe infection was

traceable to the presence of inoculum in unploughed fields in the immediate vicinity. Disking after harvesting gave poor control, only ploughing reducing infection. The disease also attacked turnip, swede, Chinese cabbage, and wild turnip, but much less severely than cabbage.

Stalk rot due to *Sclerotinia sclerotiorum* [ibid., xxiv, pp. 42, 130, 157] was present in almost every field in summer, but its absence or slight development in 70 to 75 per cent. of the acreage made its disease-index value low. Crop sanitation appears to be the only control method. Other diseases were negligible. Descriptions are given of the various diseases. The relative susceptibility of cabbage varieties to *M. brassicicola* ranged from Golden Acre, the most resistant with disease index value of only 55·4; next Round Dutch, 58·4; Resistant Detroit, 59·3; Glory of Enkhuizen, 60·5; to Hollander, 77·1; and Wisconsin Ballhead, 83·6.

Rapin (J.). **Lutte contre la cercosporiose ou maladie des feuilles de la Betterave.** [The control of *Cercospora* or leaf disease of Sugar Beet.]—*Rev. romande Agric., Vitic., Arboric.*, iii, 7, pp. 49–50, 1947.

The three copper-based fungicides, Bordeaux mixture at 1·5 per cent., copper oxide at 0·5 per cent. plus 0·1 per cent. wetting agent, and copper oxychloride at 1 per cent. [*R.A.M.*, xxiv, p. 396] were tested for control of beet leaf spot, *Cercospora beticola* [ibid., xxv, p. 324] at various experimental stations in Switzerland and particularly at Mont-Calme, Lausanne. When the crop was harvested, from 12th to 14th November, it was found that in nearly every case the application of each treatment had increased the yield. In each experiment a double treatment was given, followed by a single later one. The results showed, however, that the time of the applications was of far greater importance than the number given. The best results were obtained when the copper treatments were applied as a protectant just as the leaves had fully developed. The sugar content was increased by the spray treatment, especially at Payerne where infection was very heavy and the increase was from 12·3 per cent. to 16·2, 16·2, and 15·6 per cent. for two applications of the three sprays, respectively.

Wenzl (H.). **Versuche zur Technik der Bekämpfung der Cercospora Blattflecken-krankheit der Zuckerrübe.** [Experiments on the technique of control of the Sugar Beet *Cercospora* leaf spot disease.]—*Pflanzensch. Ber., Wien*, i, 1–2, pp. 6–13, 1947.

Sugar beet leaf spot (*Cercospora beticola*) is responsible for heavy annual crop reductions, amounting in Upper Austria [*R.A.M.*, xvii, p. 721] to 10 to 15 per cent. of the normal harvest and a corresponding loss of 25 to 30 per cent. fodder. Particulars are given of experiments in 1946, the results of which confirmed earlier (pre-war) observations as to the equal efficacy of spraying only the upper leaf surfaces with the treatment of both sides. The preparations used in these trials were 1·5 per cent. vitigran (copper oxychloride with a 15 per cent. copper content) and 1 per cent. Bordeaux, four applications being made. It is essential to use at least 500 l. of the fungicide per ha. The average increases (in doppelzentner [= 100 kg.]) per ha. in 18 treated over 10 control plots amounted to 123 (73 per cent.) leaves and 53 (15) sugar.

Hull (R.). **Sugar Beet yellows.**—*Farming*, i, 7, pp. 212–216, 4 figs., 1947.

After referring to the losses in yield caused by yellows disease of sugar beet in Great Britain [*R.A.M.*, xxvi, p. 39], the author points out that heavy infestations of *Myzus persicae*, the chief vector [ibid., xxv, pp. 135, 245], commonly arise early in summer near areas of intensive cultivation, e.g., market-gardens. The aphid overwinters in an active form on many plants in glasshouses and on the sprouts

of mangolds in clamps which may be infected, and, migrating directly from them to the young root crop, may start infection very early in the season. Recent observations indicate that *Aphis fabae* [loc. cit.] is less important in spreading the disease than was formerly thought. It is probably most damaging when heavy populations develop on infected beet and mangold seed crops in July. Spindle [*Euonymus europaeus*] and Guelder roses [*Viburnum opulus*], on which it over-winters in the egg stage, are not susceptible to beet yellows, so the migrants must feed on infected plants before they can carry yellows to beet.

In eastern England a large amount of sugar beet and mangold seed is grown and the 'stecklings' (plants set out to produce seed) are often infected in the nursery. The diseased seed crops thus produced constitute a large reservoir of infection, and the heavy aphid infestations on them spread the disease to root crops in the vicinity.

The relative importance of different sources of the virus varies from district to district. Local spread sometimes occurs round mangold clamps. Red beet, when clamped, may also act as a source of infection. Beet plants found in spring in fields which carried beets the previous year are seldom infested with aphids, but in special circumstances may become so and spread the disease to root crops.

Because of the complexities of the cycle of infection, no one control measure is likely to be wholly effective. The best solution at present appears to lie in eliminating the sources of the virus. One way to prevent infection in the seed crop is to raise the 'stecklings' in areas where the likelihood of their becoming infected is least and then transport them for planting out in the present seed-growing areas. The most suitable districts in which to raise the 'stecklings' are those mainly given over to pasture or cereals. The locality should be relatively free from mangold and sugar beet and any crops growing in the neighbourhood should be examined for the disease and its vectors. This plan was carried out on a commercial scale in 1945–6, and the resulting seed crops (which showed under 5 per cent. infection) were greatly superior to those grown from 'stecklings' in other areas, which contained 50 to 100 per cent. infected plants. To take one instance, plants raised in south Lincolnshire became 100 per cent. infected and yielded 12 cwt. per acre of seed, as against 26 cwt. per acre for plants raised in isolation.

In places where seed and root beet crops are not grown intensively, infection can be reduced if the seed is sown as late as is consistent with obtaining plants large enough for transplanting. In one trial in 1945, plants sown in mid-July contracted 30 per cent. infection as against only 5 per cent. for those sown in mid-August. Infection may be still further reduced by spraying with an insecticide, usually incorporated in Bordeaux mixture, at least fortnightly through the autumn, but the most effective spray is that applied about the middle or end of October.

At present it is not possible to give detailed measures directed against spread from mangold clamps, but the sites should be cleared as soon as the roots are finished. If mangolds are kept into the summer the shoots on the surface should be nicotine-dusted if aphids are found on them. Groundkeepers should be kept down as much as possible. Early and thick sowing is advised for root crops.

GIDDINGS (N. J.). **Dodder as an aid in testing some plant species for curly-top virus.**—*Phytopathology*, xxxvii, 5, pp. 278–280, 1 fig., 1947.

Several species of *Nicotiana* and tomato varieties are susceptible to beet curly top virus but are unsatisfactory hosts for the vector, *Eutettix tenellus*. Dodder (*Cuscuta*) thrives upon such hosts, taking up the virus, and *E. tenellus* feeds well upon the dodder, readily picking up the virus. During 1938–9 three groups of previously inoculated Turkish tobacco plants were tested for the presence of the beet curly top virus by means of dodder (*C. subinclusa*) [*R.A.M.*, xxiv, p. 136],

using young sugar beets as test plants and one leafhopper (*Eutettix tenellus*) per plant for inoculation and five groups using leafhoppers without dodder. Of the 49 tobacco plants tested by the latter method, transmission to sugar beets failed in 45 per cent., the corresponding figure for the 24 on which dodder was used being only 25. There was more than 2½ times as much infection among the sugar beet plants when *C. inclusa* was used (52 per cent. diseased) as when the trial was made with leafhoppers transferred directly from tobacco (20 per cent.).

In a comparative experiment in 1939 with inoculated plants of *Nicotiana glutinosa* there was more than five times as much curly top in the sugar beet test plants when dodder was used as with the direct feeding method.

JAUCH (CLOTILDE). **La 'mancha chocolate' de les Habas.** [Chocolate spot of Broad Beans.]—*Rev. Invest. agríc., B. Aires*, i, 2, pp. 65–80, 4 pl., 2 figs., 1947.

In the vicinity of Buenos Aires chocolate spot of broad beans is caused by two species of *Botrytis*, *B. fabae* [*R.A.M.*, xxvi, p. 476, and next abstract] and *B. cinerea* [ibid., xvi, p. 723], of which the former appears to be the more widespread and virulent. Wilson's 'aggressive' and 'non-aggressive' types of foliar infection were both recognized, the former characterized by diffuse, leaden-grey lesions and the latter by amphigenous, circular, chocolate-coloured spots, 1 to 3 mm. in diameter. On the stems the lesions are elongated, somewhat depressed, and nearly always bordered by a reddish line; towards the base they are so numerous as to impart a necrotic aspect to the infected area. Both the sepals and petals are dotted with small, dark spots, which stand out prominently on the white ground: some are rounded, others elongated, with dark brown centres paling towards the edge and encircled by a halo. In severe attacks the inflorescences present a necrotic appearance within two days, a diffuse, black tinge spreading from the tip over the whole petal. In many cases the small, dark spots on the pods are largely confined to the one surface or edge exposed to the spores borne on the wind prevailing during the growing period. The lesions were repeatedly observed to harbour varying numbers of sclerotia, 0·5 to 1 by 0·5 to 2 mm., which also developed on the stems of withered plants in the field [cf. ibid., xiii, p. 741].

Monospore cultures of *B. fabae* on 13 media fell into two types, designated A and B, but there was no corresponding segregation in *B. cinerea*. On maize meal agar *B. fabae* A formed a profusion of sclerotia, which were also numerous on various other substrata, including potato dextrose agar, broad bean seed decoction with gelatine or dextrose and agar, and carrot agar. *B. fabae* B produced few or no sclerotia on most media, only sterilized broad bean stems lending a moderate stimulus to their formation. A fair number of sclerotia of *B. cinerea* developed on maize meal, potato dextrose, and carrot agars. Neither type of *B. fabae* formed many macroconidia except on broad bean decoction with dextrose and agar (A) or gelatine (B). The latter medium also promoted microconidial formation by type B, but A did not produce large quantities of these spores on any substratum, the best for the purpose being broad bean decoction dextrose agar, sterilized rice, and sterilized broad bean stems. The extent and colour of the mycelium also varied with the medium, that of *B. fabae* A being generally sparser than that of type B or *B. cinerea* except on the broad bean decoctions; *B. cinerea* was grey on all the media except asparagin agar (light brownish) and broad bean seed decoction with gelatine (white), whereas the two types of *B. fabae* ranged from white to light brownish.

The typical symptoms of chocolate spot developed in broad bean plants inoculated with both species of *Botrytis* through the leaves, stems, flowers, and pods. In field experiments in 1944 to determine the reactions to chocolate spot of five varieties, viz., Agua dulce, Argentina, del País, de Sevilla, and Windsor, in con-

junction with the sowing date, all were found to be susceptible. The incidence of infection was highest in the two first of the fortnightly sowings made from 16th April to 2nd August, inclusive, and decreased as the season advanced, the stands of the two latest dates being virtually free from chocolate spot. Spraying was found to be profitable only in wet seasons, when 1 per cent. Bordeaux mixture should be applied during the flowering and fruiting periods.

A virulent outbreak of *Ascochyta fabae* [ibid., xxiv, p. 129] occurred on the Argentina and del País varieties.

REICHERT (I.) & PALTI (J.). **Rust and chocolate spot of Broad Beans in Palestine.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 202–213, 1 fig., 1946. [Hebrew summary.]

Investigations were carried out from 1939 to 1943 to determine the best methods of broad bean cultivation in Palestine to avoid excessive losses from rust (*Uromyces fabae*) [*R.A.M.*, xxiii, p. 253] and chocolate spot (*Botrytis fabae*) [ibid., xx, p. 188, and cf. preceding abstract]. The latter disease was simultaneously recorded in widely separated parts of the country, comprising the coastal plain, Jordan Valley, and Upper Galilee. In November- to December-sown crops, *B. fabae* usually appeared in January, irrespective of marked differences in the mean temperature, e.g., 10° C. at Mikve Israel (central coastal plain) in December to January, 1941–2, compared with 16° in 1940–1. On the other hand, the dates of rust development on comparable crops in the several localities often differed by as much as two months, depending on temperature levels. At daily means of 10° or below, for instance, rust was never observed to occur, while during or after months with daily means of 12·5° it was sporadic. At and above 14° infection took place regularly at relative humidities from 73 to 78 per cent. in localities where the preceding month was also fairly warm, but not at 68 per cent. where the foregoing months were colder.

In four spraying trials the two diseases were effectively combated by $\frac{1}{3}$ per cent. perenox, the first application being given immediately after the appearance of symptoms and repeated at 10- to 14-day intervals. The treatments significantly increased the green pod yield (by 58 per cent.) in early and severe attacks of rust. Crops grown for green fodder or green pods should be sown sufficiently early for picking to begin in the first days of February. No practical control measures can be recommended for non-irrigated crops (for silage and seeds), which cannot be sown until after the first rain, and their cultivation entails a considerable risk unless varieties resistant to rust and chocolate spot can be procured.

DANA (B. F.). **Phyllody of common Beans, a graft-transmissible disease.**—Abs. in *Phytopathology*, xxxvii, 5, pp. 360–361, 1947.

Scions from phylloid inflorescences of naturally infected beans [*Phaseolus vulgaris*: *R.A.M.*, xx, p. 225], cleft-grafted on ten greenhouse plants of the Red Kidney, Bountiful, Asgrow Stringless Green Pod, and U.S. No. 5 varieties, induced phyllody in nine. In their turn, scions from the phylloid inflorescences of the inoculated individuals transmitted the disease to 11 out of 20 plants of Logan, Red Kidney, Bayo, Bountiful, and U.S. No. 5. Phyllody has been observed in Oregon on bean varieties resistant to curly top [beet curly top virus: ibid., xxii, p. 86; xxv, p. 592] as well as on plants of susceptible ones that escaped infection. A similar disease, big bud [tomato big bud virus], occurs on tomato [ibid., xx, p. 235; xxvi, p. 135], while a condition apparently identical with phyllody has been observed on various hosts of the aster yellows virus [ibid., xxv, p. 396]. It seems, therefore, that one or more strains of the aster yellows virus may be implicated in the occurence of phyllody on bean, Lima bean [*P. lunatus*], soy-bean, tomato, lucerne, and squash.

Silberschmidt (K.) & Nobrega (N. R.). **Notas sôbre uma doença de virus em Feijão de Porco (Canavalia ensiformis D.C.) e outra em Feijão comum (Phaseolus vulgaris L.).** [Notes on a virus disease of Hog Bean (*Canavalia ensiformis* D.C.) and another of common Bean (*Phaseolus vulgaris* L.).]—*Biológico*, viii, 5, pp. 129–133, 2 pl., 1942. [English summary. Received August, 1947.]

A young hog [sword] bean (*Canavalia ensiformis*) plant in an experimental field in São Paulo, Brazil, displayed interveinal chlorosis and veinbanding of the leaves, producing a mosaic pattern without blistering. The disease was transmitted by sap inoculation to the original host, *Soja* [? *Glyciñe*] sp., sweet pea, and the Embaré, Torta, and Mangetail pea varieties.

Four bean (*Phaseolus vulgaris*) plants in a garden in the same locality showed foliar mottling, accompanied in the older leaves by slight rugosity and savoying of the lamina [cf. *R.A.M.*, xxi, p. 115]. The disease was conveyed by sap inoculation to Longfellow and Don Carlos beans and Torta and Mangetail peas.

The viruses responsible for both diseases are believed to belong to the pea group but to be distinct from one another.

Yu (T. F.). **A mosaic disease of Cowpea (Vigna sinensis Endl.).**—*Ann. appl. Biol.*, xxxiii, 4, pp. 450–454, 1 pl., 1946.

In 1939 a mosaic disease of cowpea (*Vigna sinensis*) [*V. unguiculata*: *R.A.M.*, xviii, p. 608; xxvi, p. 479] was very prevalent in the Yangtze valley, China, sometimes causing heavy losses in susceptible varieties. The symptoms differ with different varieties and, in the same variety, with the type of leaf, time of infection, climatic conditions, and individual plant. The first symptom in artificially infected plants is vein clearing, spreading from the base of the leaf over the whole surface. After 10 to 12 days the symptoms on the young inner leaves change to a conspicuous mottling. The irregular light and dark green areas between the veins may produce little or no distortion of the leaf surface of less susceptible varieties. Chlorotic areas are generally distinctly demarcated from the green tissue. In some cases, almost the whole leaflet is chlorotic, while others show only small chlorotic blotches. The irregular, light green patches frequently contain islets of normal green, often parallel to the veins. Accompanying the mosaic symptoms, a slight convex cupping, arching, or inward rolling of the margin of the leaflets is often present. Affected leaves are often puckered, with deep marginal indentations. In some varieties and in certain climatic conditions, yellow primary lesions develop, turning dark brown at the end of the growing season. Dark reddish-brown discoloration may also be produced on the veins. As a rule, the symptoms are most severe in the upper part of the plant. The top leaves, in addition to showing the symptoms described above, are stunted, misshapen, and puckered, with dark green areas along the veins. The affected leaflets tend to be asymmetrical, dwarfed, wrinkled, crinkled, deformed, twisted, and curled either inwards or downwards about the margin. The plants are stunted, have shortened internodes, and branch excessively, while pod deformation is common on susceptible varieties such as Long Pod.

Experimental evidence showed that the virus is transmitted by *Aphis rumicis*, *Macrosiphum pisi*, and *A. gossypii*, as well as by artificial juice inoculation. It is seed-borne, withstands ageing *in vitro* for three days at 22° C., is inactivated at about 62°, and tolerates a dilution of about 1 in 3,000. It was mechanically and aphid transmitted to Lima bean (*Phaseolus lunatus macrocarpus*) and adzuki bean (*P. angularis* var. Chu-Sha).

The symptoms and properties of the virus closely resemble those of asparagus bean (*V. sesquipedalis*) mosaic, while, on the other hand, its symptoms and host range closely resemble those of McLean's cowpea mosaic [caused by a strain of

cucumber mosaic virus; loc. cit.]. The three viruses appear to be closely related, if not identical.

SEVERIN (H. H. P.) **Newly discovered leafhopper vectors of California Aster-yellows virus.**—Abs. in *Phytopathology*, xxxvii, 5, p. 364, 1947.

The following leafhoppers, in addition to those already reported [*R.A.M.*, xxvi, pp. 277–279 and next abstract], have recently been determined as vectors of the California aster yellows virus, which now number in all 22 species and one biological race belonging to 12 genera: *Idiodonus heidemani*, *Colladonus commissus*, *C. flavocapitatus*, *Friscanus intricatus*, *F. rupinatus*, *Cloanthanus dubius*, *Fiebriella florii*, and *Chlorotettix similis*.

SEVERIN (H. H. P.). **Plant symptoms induced by feeding of some leafhopper species.**—*Hilgardia*, xvii, 5, pp. 219–221, 4 pl., 1 fig., 1947.

Brief descriptions are given of the symptoms of chlorosis, veinbanding, and vein clearing, produced on healthy China aster and Golden Leaf-Blanching celery plants by 10 species of leafhopper vectors of California aster yellows [*R.A.M.*, xxv, p. 285 and preceding and next abstracts], caused apparently by the saliva or feeding.

SEVERIN (H. H. P.). **Acinopterus angulatus, a newly discovered leafhopper vector of California Aster-yellows virus.**—*Hilgardia*, xvii, 5, pp. 197–205, 1 col. pl., 1947.

In studies of the transmission of the California aster yellows virus [see preceding abstract] by the leafhopper *Acinopterus angulatus* to celery and asters it was found that transmission from diseased celery by 50 males and 50 females tested singly on healthy celery averaged 8 per cent. The average percentage of infection of successive celery at irregular intervals of inoculation by lots of 5 males and 5 females was 29·8, by lots of 10 males and 10 females, 51·9, and by lots of 20 males and 20 females, 35·6. The total percentages of infection in weekly inoculations of celery by lots of 5, 10, and 20 males were 8·3, 18·3, and 15, respectively, and by lots of 10 females at three-weekly intervals 46·3.

Infections by 50 males and 50 females transferred singly from diseased celery to healthy asters averaged 9 per cent. The total percentage of infections produced in successive asters by lots of 10 and 20 males transferred at irregular intervals was 14·3, while with lots of 5 and 10 males transferred at three-weekly intervals the percentages were 9·1 and 18·7, respectively.

Weekly inoculations of celery alternating with asters by lots of 40 males reared on diseased celery gave the following percentages of infection: celery 53·3 and asters 26·7; those reared on diseased asters and transferred to asters alternating with celery, 40 and 20, respectively.

The minimum latent period of the virus in male adults ranged from 11 to 26 (average 18·4) days. One female retained the virus for 51 days after producing the first infection, other adults caused only the first infection.

ZABALA (S.) & DELLE COSTE (A. C.). **Identificación del 'polvillo' del Tabaco con uno de los mosaicos del Pimento.** [Identification of the Tobacco 'fine dust' with one of the Chilli mosaics.]—*Rev. argent. Agron.*, xiii, 3, pp. 167–180, 1 pl., 1947.

A study of the symptomatology, physical properties, mode of transmission, and host range of a chilli mosaic in Argentina revealed the identity of the virus concerned with that of the 'polvillo' or 'fine dust' of tobacco [*R.A.M.*, xi, p. 269]. It is evidently distinct from the viruses responsible for 'blanching' of the same host in Spain [ibid., xx, p. 225] and mosaic in Puerto Rico [ibid., xxi, p. 401], and is provisionally regarded as a new infectious entity.

The thermal death point of the virus lies between 56° and 58° C. It tolerates a dilution of 1 in 10,000 but is inactivated at 1 in 100,000. It loses its pathogenicity after 22 hours at 22° to 25°. It is not transmissible by way of the seed but is readily conveyed from diseased to healthy plants by juice inoculations; *Myzus persicae* was the only one of eight insects tested to give positive results in transmission experiments. The virus was inactivated by the admixture with the juice of 50 per cent. absolute alcohol, 1 per cent. 0·1 M potassium cyanide, or 2 per mille mercuric chloride.

The common name of 'mosaic' adequately describes the symptoms on chilli, which include a very irregular mottling of the leaves, with a vivid green coloration of the parts bordering the veins, pronounced distortion, and slight marginal undulation; alternate chlorotic and bright green spotting of the stunted and malformed fruits; shortening of the internodes and foliar mottling of the new shoots; stunting of the plants and extensive floral abortion. 'Polvillo', on the other hand, is not an appropriate designation for the tobacco disease caused by the same virus, but it is in general use among growers and should therefore be accepted.

Baker (K. F.). **Transmission of Rhizoctonia solani in Pepper seed and its prevention.**—Abs. in *Phytopathology*, xxxvii, 5, p. 359, 1947.

[Chilli] pepper seedlings are liable to severe damage from pre- and post-emergence damping-off (*Rhizoctonia* [*Corticium*] *solani*) in southern California. The transmission of the fungus within the seed was demonstrated by planting infected seed on moistened, pasteurized black peat in Petri dishes and by sectioning. Large fruits in particular frequently rest on the ground in seed fields and much 'soil rot' occurs before the delayed harvest. The pathogen enters the seed from the funiculus in the micropyle-radical region. Further infection is favoured by maceration and fermentation in cleaning. The pathogen is also carried in fragments of fruit tissue. Up to 0·3 per cent. of commercial seed is infected, a matter of importance in (*a*) the contamination of pasteurized or non-infested soil and (*b*) the perpetuation of strains causing damping-off, wire stem, and fruit rot. Half an hour's immersion of the seed in water at 51·7° C. eliminated *C. solani* without reduction of germination in large-scale tests over a period of three years.

Blumer (S.) & Peyer (E.). **Versuche zur Bekämpfung der Peronospora im Weinbau.** [Experiments in *Peronospora* control in viticulture.]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 62–67, 3 figs., 1947.

Copper oxide (0·4 to 0·5 per cent.) did not confer such a high degree of protection against downy mildew (*Peronospora*) [*Plasmopara viticola*] in the Wädenswil (Zürich) Experiment Station vineyards in 1946 as 1·3 to 1·5 per cent. Bordeaux mixture [*R.A.M.*, xxvi, p. 182 and next abstract]. In the nursery copper oxide is preferable to Bordeaux mixture in the early stages of growth, since it does not scorch the plants and consequently permits early and luxuriant leafage, which in turn promotes root development. Later in the season, however, 1 per cent. Bordeaux should be applied.

Zäch (C.). **Über die Regenbeständigkeit von Kupferspritzmitteln. Laboratoriumsversuche an Spritzmitteln für den Weinbau.** [On the rain-fastness of copper sprays. Laboratory tests on copper sprays for viticulture.]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 67–70, 2 graphs, 1947.

To determine the relative tenacity of various copper mixtures used against downy mildew [*Plasmopara viticola*] in Swiss vineyards [see preceding abstract], vine leaves, 15 cm. in diameter, or alternatively glass slides, 70 by 35 mm. (16 per test), were uniformly covered with the different materials and then subjected for

half an hour to artificial rain (corresponding to a precipitation of 10 mm.) from a modified Görnitz apparatus [*R.A.M.*, xii, p. 577]. The amount of copper thus deposited on the leaves and slides ranged from 1 to 3 and 0·5 to 1 mg., respectively, per 100 c.c. Under these conditions Bordeaux mixture was the most persistent of the fungicides tested, followed in descending order by copper oxychloride pastes, copper oxide, and copper oxychloride dust.

BLUMER (S.). **Versuche zur Bekämpfung der Graufäule (Botrytis cinerea).** [Experiments in the control of grey mould (*Botrytis cinerea*).]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 51–61, 3 figs., 1 graph, 1947.

Grey mould (*Botrytis cinerea*) is responsible for more or less severe annual depredations in Swiss vineyards [*R.A.M.*, xxvi, p. 185], especially among the Riesling × Sylvaner and Blue Burgundy varieties. Although both thiuram (organol and pomarsol) and oxyquinoline (travacid with adhesive and tumex liquid) preparations gave encouraging results in control experiments from 1944 to 1946, inclusive, they are at present too erratic in operation to be recommended for commercial use, while another objection lies in the increased development on the treated grapes of other fungi, notably green mould (*Penicillium*) normally held in check by *B. cinerea*.

PEYER (E.). **Fragen und Antworten über die Rotbrennerbekämpfung.** [Questions and answers on 'rotbrenner' control.]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 75–76, 1947.

Some important questions relating to the control of vine 'rotbrenner' [*Pseudopeziza tracheiphila*] in Switzerland [*R.A.M.*, xxvi, p. 376] are answered on the basis of the author's practical experience during the past four years. The fungus overwinters exclusively in infected leaf debris, from which spores are discharged in the spring or, in dry seasons, until the late summer, giving rise to fresh infections. Proof that the disease can be effectively combated in plots heavily infested the year before was obtained in 1945, when vines sprayed on 29th April, 9th, 18th, and 31st May, 18th June, and so forth, remained entirely healthy. The general opinion that only the first fungicidal treatment is of any avail against the pathogen has been disproved by experiments carried out since 1942. A very early application, when the shoots are 15 to 20 cm. long, may be critical, but the following treatments were equally if not more so during the period under review, when primary infection occurred mostly between the first and second or second and third, e.g., in 1943 at the end of May, 1944 from 18th to 25th June, 1945 at the beginning of June, and 1946 between 13th and 18th May.

During the crucial period for infection, therefore, the vines should be sprayed weekly, preferably with 1·5 to 2 per cent. Bordeaux mixture at dosages of 25 to 30 l. per are [100 sq. m.] for hybrids and 20 to 25 for direct bearers. Other control measures include the prompt collection and burning of newly infected leaves and of those blown against walls or into ditches, and deep ploughing of the soil to bury these sources of contamination.

The most susceptible varieties are Blue Burgundy, Gutedel, and Elbling, but Räuschling and Riesling × Sylvaner were also heavily infected during the period of observation in the dry sites which have been found specially favourable to the fungus.

In 1942 and 1943, at the beginning of the present epidemic, the damage caused by *P. tracheiphila* was generally considered to be negligible, but after several consecutive years of infection the vines have been found to suffer appreciably both in respect of development and in the quantity and quality of the yields. Failure to recognize the serious character of the disease in time was the main reason for its extensive spread, which has been aided by the dry periods in every spring since

1942, as well as by the stringent copper shortage during the war. Energetic measures are now necessary to eliminate the parasite by means of an intensive spraying campaign, comprising at least three pre-blossom applications.

HEWITT (W. B.). **Sodium arsenite, a promising control of dead-arm of Grapes.**—Abs. in *Phytopathology*, xxxvii, 5, p. 362, 1947.

Olivette blanche vines [? in California], infected with *Cryptosporella viticola* [*R.A.M.*, xxiv, p. 3], were sprayed during dormancy with a sodium arsenite solution containing an equivalent of 3 lb. arsenic trioxide per 100 gals. water. Three blocks of vines, six rows each, averaging 43 shoots per vine, sprayed on 11th February, 1944, showed, respectively, averages of 4·6, 4·9, and 5·1 diseased shoots per vine, the corresponding figures for untreated blocks being 27, 25·5, and 22·6. Similar blocks sprayed in 1945 were little affected by dead arm. In 1946 shoot and leaf infections were mild, but in three blocks sprayed on 14th March one or more diseased shoots developed on 2·6, 18·7, and 7·3 per cent. of the vines compared with 46·6, 27·5, and 52·6 per cent. in corresponding untreated blocks. In random collections of material from the 1944 plots 1 to 10 per cent. of the pycnidia on 38 out of 138 sprayed spurs and 60 to 85 per cent. of those on 93 out of 106 untreated spurs extruded spore horns.

NYSTERAKIS (F.). **Nouvelle interprétation du mécanisme du rabougrissement (court-noué) des Vignes.** [A new interpretation of the mechanism of Vine court-noué.]—*Rev. hort., Paris,* N.S., xxx, 17–18, pp. 306–315, 7 figs., 1947.

This is an account of work previously noted from another source [*R.A.M.*, xxv, p. 95].

RYJKOFF (V. L.). Фитопатогенные вирусы. [Phytopathogenic viruses.]—219 pp., 50 figs., Publ. Dep. Acad. Sci. S.S.S.R., Moscow, Leningrad, 1946.

This handbook gives descriptions of virus diseases prevalent in the U.S.S.R. The diseases are discussed according to the family of the host plant and separate chapters are devoted to the following topics: (i) virus diseases of the nettle and related plants, (ii) those of the Chenopodiaceae, (iii) cruciferous plants, (iv) Malvaceae, (v) the vine, (vi) fruit trees of the Rosiflorae group, (vii) Rosaceae (raspberry, strawberry, and rose), (viii) Leguminosae, (ix) Umbelliferae, (x) Solanaceae (tobacco), (xi) Solanaceae (potato), (xii) vegetable marrow, (xiii) Compositae, (xiv) Gramineae, and (xv) Liliaceae. The symptoms of each disease are described and directions for control given. The author adopts K. M. Smith's nomenclature for the viruses.

JEFFERS (W. F.). **Evaluation of several fungicides in preventing infection of Sweet Potato slices by Ceratostomella fimbriata.**—Abs. in *Phytopathology*, xxx, vii, 6, p. 439, 1947.

Slices of Maryland sweet potato were placed in an inoculum of *Ceratostomella fimbriata*, the causal organism of black rot, and then dipped in one of a series of dilutions of several fungicides ranging from 0·001 to 100 gm. per l. The pieces were then incubated in moist chambers at 28° C. for four days. By this time the surfaces of the control slices dipped in water were covered with the fungal growth, ascospores and conidia being produced in abundance. High toxicity to the pathogen was shown by puratized N5E, isothan Q15 [*R.A.M.*, xxvi, pp. 67, 97, 211], mercuric chloride, semesan bel, and puratized 177 (para-amino phenyl cadmium dilactate). Borax, wettable spergon, zerlate, and phygon [loc. cit.] were moderately effective, copper 8-hydroxyquinolate, fermate, and zinc ethylene bisdithiocarbamate only slightly so. In general, the chemicals giving best control of *C. fimbriata* were most injurious to the host tissue.

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BADCOCK (W. J.). **Annual Report, British Solomon Islands Protectorate, 1946.**—13 pp., 1947. [Mimeographed.]

During 1946, the most serious plant disease in the Solomon Islands was a suspected virus disease of taro [*Colocasia antiquorum*] in the Shortlands. Sigatoka disease of bananas due to *Cercospora musae* [*Mycosphaerella musicola*: *R.A.M.*, xxvi, p. 250] is serious everywhere, but spraying is not feasible and the only practical remedy appears to consist in continuing the present method of growing isolated plants. On a few occasions, rice plots were virtually destroyed by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xxvi, p. 167], but incidence was quite localized.

GIBBS (J. G.). **Abstract of Report on the work and findings of the Department of Agriculture, Falkland Islands, 1937 to 1946.**—13 pp., 1947. 1*s*.

During the period under review, small yields of swede seed were obtained in the Falkland Islands under somewhat adverse cultural conditions. The Colony appears to be free from insect carriers of *Phoma lingam*, so that a seed trade between the Falkland Islands and New Zealand in disease-free swede seed should be possible. The Colony also possesses the climate and the freedom from insect vectors of virus diseases necessary for the production of high-quality seed potatoes, for which potential markets exist in Uruguay and Argentina. *Synchytrium endobioticum* and *Spongospora subterranea* are present, but could be kept out of seed potato areas.

MILBRATH (D. G.). **Bureau of Plant Pathology.**—Ex *Rep. Dep. Agric. Calif., 1946* (*Bull. Dep. Agric. Calif.*, xxxv, 4), pp. 230–241, 191, 1 map, 1946.

In this report [cf. *R.A.M.*, xxvi, p. 189] it is stated that the peach mosaic eradication campaign was continued, the number of new cases noted being less than for any previous year. Altogether 536,147 trees were inspected and 914 new cases found. Newly infected properties numbered 54 with 95 infected trees. New peach varieties free from mosaic, grown on supervised plots within the quarantine area, have been released for general distribution.

G. L. STOUT reports that extensive vine inspections have shown that there was a considerable increase in Pierce's disease [caused by lucerne dwarf virus] in Stanislaus County [loc. cit.] during the year.

Examinations for chestnut blight (*Endothia parasitica*) [ibid., xxv, p. 15] showed an increase in the numbers of infected trees in San Joaquin County. It is suggested that the fungus entered into the trunks years ago through wounds resulting from removal of sprouts, but made only slow progress during many years.

In 1941 an unusual foliage spotting was discovered on a green-leaved variety of *Aucuba japonica*. The ring patterns, general distribution, development, and colour resembled the ring spot of peach leaves. The spots were very numerous, 1 to 5 mm. in diameter, small and medium-sized ones often showing a more distinct ring development than the larger. The rings were light green with medium-green centres. Leaves of all sizes and age were attacked. Patch bark grafts were placed on a healthy plant and after about 15 months the leaves of the inoculated plant showed the typical spots, suggesting that it is probably a virus disease.

G. KenKnight reports that the *Omphalia* Date Root Rot Survey [ibid., xxiv, p. 411], now in its second year, has as its objective the determination of sources of date offshoots which are free from *Omphalia* [*O. pigmentata* and *O. tralucida*]. About 240 orchards have been surveyed and 1,200 root samples examined, 11 per cent. of which showed *Omphalia*. It was isolated readily from weak palms and in orchards where decline symptoms were conspicuous, and was obtained only from rotten date roots and from necrotic root tips. These are abundant on weak palms, but also occur on apparently normal trees, from 70 of which *Omphalia* cultures were obtained, as they were from palms in 10 orchards where no decline symptoms were apparent. Cultures were also obtained from 16 of 26 orchards where the disease had not been reported prior to the survey. *Omphalia* was found on three palms originally obtained from Algeria and one from Egypt. Neither *O. tralucida* nor *O. pigmentata* was obtained from 44 root samples from the native palm *Washingtonia filifera*, but *Omphalia* was found on seedling palms growing 250 yds. away from palms derived from imported shoots.

In April, 1946, a new disease of sweet cherry trees was reported from an orchard near Brentwood, Contra Costa County. The malady did not spread to surrounding orchards and only Bing trees were affected. The symptoms of the disease were blistering of the bark of large limbs with subsequent roughening; small, brown, necrotic leaf flecks which eventually dropped out, leaving a shot-hole effect; and bud failure, followed by death, of one-year-old twigs. Severely affected trees showed many dead twigs and were much smaller in the top. A virus disease is suspected.

In order to prevent further spread of yellow bud mosaic of peach [ibid., xxvi, p. 189], which is widely distributed in the Winters and Suisun Valley areas, a quarantine regulation was issued in 1945 which prohibited the removal of all almond, apricot, nectarine, and peach trees from the infected area.

Western celery mosaic [celery mosaic virus: ibid., xxvi, p. 148] was more widely distributed than in previous years. It occurred in San Joaquin Delta, Salinas Valley, Santa Clara Valley, and Santa Maria district. In the controlled areas where the crop-free period method is employed, the occurrence was very slight.

In the report of the Bureau of Entomology and Plant Quarantine, H. Wallace (pp. 190–193) states that tomato-growers in Kern County and melon-growers in Stanislaus County suffered serious losses due to a high incidence of beet curly top virus transmitted by a high leafhopper population. The losses among spring-planted tomatoes were for Kern County 33·5 per cent., Tulare 26 per cent., and Fresno 16·8 per cent.; and among summer-planted tomatoes in Kern County 53·1, and Tulare 10·3 per cent. Spray applications alone are not sufficient to control leafhoppers in years of great abundance. The effectiveness of Russian thistle [*Salsola kali* var. *tragus*] elimination is stressed.

Bertus (L. S.). **Plant pathology.**—*Adm. Rep. Dir. Agric., Ceylon, 1945*, pp. D9–D11, 1946.

During the period under review [cf. *R.A.M.*, xxv, p. 27] the following diseases were observed for the first time in Ceylon: onion 'blast' of physiological origin [ibid., xxiv, p. 48], *Sclerotium rolfsii* attacking garlic leaves and bulbs, *Rhizoctonia* [*Corticium*] *solani* causing damping-off of lime [*Citrus aurantiifolia*] seedlings, mango flower mildew (*Oidium* sp.) [? *O. mangiferae*: ibid., xxi, p. 31], and dry rot of sugar-cane (*Botryodiplodia theobromae*) [ibid., xviii, p. 624].

The progress of the root disease caused by *Xylaria thwaitesii* in four rubber trees [ibid., xviii, p. 579] on a steep slope in the Galagedera district was observed to be very slow.

Ten five-year-old coco-nut palms in the vicinity of Matale were killed by bud rot (*Phytophthora palmivora*), being traced to the severely diseased fruits of a breadfruit [jak: *Artocarpus integer*] tree in their midst.

Of 90 orange, mandarin, and grapefruit trees suffering from pink disease [*C. salmonicolor*] at Nalanda Fruit Station, 21 had to be eradicated, while the remainder were treated by excision of the infected branches, painting the healthy ones, especially at the forks, with brunolinum plantarium solution, tarring the cut ends, and spraying with colloidal copper.

In connexion with the plantain bunchy top eradication campaign [ibid., xx, p. 290] 560,086 diseased plants were uprooted and destroyed, and visits paid to 55 gardens covering 203 acres to inspect the work already done.

A fortnight after the inoculation of 100 lb. straw on 25th May with a pure culture of *Volvaria diplasia* [ibid., xxiii, p. 166], mushroom production began, and the final yield reached 2 lb. $1\frac{1}{2}$ oz. The average temperature during this period was 80·6° F.

Bremer (H.), İşmen (H.), Karel (G.), Özkan (H.), & Özkan (M.). **Beiträge zur Kenntnis der parasitischen Pilze der Türkei. I.** [Contributions to knowledge of the parasitic fungi of Turkey. I.]—*Rev. Fac. Sci. Univ. Istanbul*, Ser. B, xiii, 2, pp. 122–172, 1 pl., 2 figs., 1947. [Turkish summary.]

The observations comprised in this first instalment of an account of the parasitic fungi [and bacteria] of Turkey cover the period from 1938 to 1946 and include the following. Crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xiii, p. 16] is occasionally found on beet and is widespread on peach, plum, and quince, while reports of its occurrence on apricot, sour cherry, pear, and apple have also been received. The disease assumes a destructive form on vines, killing numerous stocks. *P.* [*Xanthomonas*] *phaseoli* was identified for the first time in Turkey as the agent of a blight of bean (*Phaseolus vulgaris*) leaves, stems, and pods. Twenty-five seeds from diseased plants gave rise to six (24 per cent.) seedlings with primary infection. *Pseudomonas* [*X.*] *malvacearum* attacks both *Gossypium herbaceum* and *G. hirsutum* but is not reckoned among the principal pests of the cotton crop. Olives in the coastal regions of south-western Anatolia sustain considerable damage from knot disease (*P. savastanoi*). Tobacco wildfire (*P. tabacum*) appears to be co-extensive with the cultivation of the crop.

P. [*Bact.*] *sesami* is believed to be the causal organism of a wilt of sesame [ibid., xiii, p. 565] apparently new to Turkey but possibly identical with the bacteriosis described by Malkoff from Bulgaria [*Zbl. Bakt.*, Abt. 2, xi, pp. 333–336, 1904; xvi, pp. 664–666, 1906]. Primary infections on the leaves often appear as angular, vein-delimited, brown spots with blackish-brown margins, attaining a diameter up to 2 cm. and coalescing to produce a dark network on a brown ground. Primary infections on the stems commonly occur at the site of insertion of the petioles, while girdling may lead to the collapse of the whole plant. Sections through the stems reveal the permeation of the cortex by large irregular lacunae, in which the tissue is totally disorganized and filled with bacteria. In severe cases the vascular bundle ring is disrupted in places and infection advances into the medulla, while the vessels may also contain bacteria; these were isolated in pure culture on potato agar, on which they formed circular, slimy to liquid, lustrous, whitish-grey, faintly pink-tinged colonies with entire margins. Inoculations on healthy sesame plants with diseased material and pure cultures of the bacterium resulted in the development of typical symptoms of the wilt. The disease may assume considerable economic importance in a region such as the Anatolian plateau, where the abrupt changes of temperature adversely affect the crop. The average numbers of capsules on ten healthy and ten partially wilted plants were 10·8 and 4·9, respectively.

Olpidium brassicae was commonly observed in the roots of young tobacco plants [*R.A.M.*, xix, p. 308] but no correlation could be traced between its presence and chlorosis, which is considered more likely to be due to non-parasitic factors such as excessive humidity and unduly close spacing.

Albugo candida [*Cystopus candidus*: ibid., xiv, p. 1 *et passim*] was found on mustard, radish, and various wild plants. Vine downy mildew (*Plasmopara viticola*), though widespread in Turkish vineyards, does not cause the devastating losses experienced in more humid climates, at any rate on the central Anatolian plateau. In the south-west of the province, one or two prophylactic treatments with Bordeaux mixture are usually applied in the spring. Further applications are required only in the exceptional seasons with abnormally heavy spring and early summer rainfall, such as 1940, when up to 80 per cent. damage was recorded owing to neglect of this precaution.

Lettuce downy mildew (*Bremia lactucae*) [ibid., xxvi, p. 3] is invariably associated with low temperatures and a fairly high degree of humidity, infection being normally confined to the basal leaves and causing material damage only on winter crops in the Izmir region. Other hosts of the fungus are the wild lettuce, *Lactuca scariola*, and *Carduus pycnocephalus*, the conidia on the last-named measuring 15 to 19 by 14 to 17 μ.

Taphrina deformans is widespread and destructive on peaches, trees with every leaf infected being no exception. Almonds are also regularly attacked by the leaf curl in a milder form. *T. pruni* appears to be prevalent on plums.

Cereal mildew (*Erysiphe graminis*) is prevalent in the Izmir region, where the mild, damp, Mediterranean winter favours the development of the fungus on oats, *Avena sterilis*, wheat, and barley. It is pre-eminently a disease of young plants, very little infection occurring on barley, for instance, once the ears begin to emerge, irrespective of the date of sowing. A varietal test showed that the very slowly developing Guzak barley was more severely attacked at all stages than the more rapidly growing California and Elsisehir varieties, the counts on a scale ranging from 0 (immune) to 5 (very severe infection) on 30th January, 13th February, 7th and 28th March, and 26th April, 1939, being 1·6, 2·2, 2·8, 0·9, and 0, respectively, for the first-named, 1·1, 1·5, 1·7, 0·3, and 0 for the second, and 0·9, 1·2, 1·1, 0·4, and 0 for the third, with averages of 1·5, 0·9, and 0·7, respectively. A cold, dry spell, resulting in a check to growth at the critical phase was evidently the primary cause of the outbreak [cf. ibid., xxiii, p. 292]. In another test in 1939–40 to determine the influence of the sowing date on the incidence of mildew, the percentages of infection on 30th April for the 7th October, 12th December, 30th January, and 28th February series were 0, 0, 48, and 68, respectively, while by 10th May perithecia had developed on the dry basal leaves in the two latter [cf. ibid., xvi, p. 801]. Here correlation between the stage of growth of the plants and the incidence of mildew is again exemplified.

E. pisi was observed on winter pea crops in the vicinity of Izmir only. The dimensions of the conidia, perithecia, asci, and ascospores of a strain of the fungus from lucerne at Ankara were 32 to 34 by 14 to 19, 94 to 143, 57 to 82 by 28 to 45, and 17 to 29 by 11 to 15 μ, respectively, compared with those of Blumer's mid-European strain, which measured 27 to 33 by 14 to 17, 85 to 126, 50 to 60 by 30 to 40, and 22 to 27 by 13 to 16 μ, respectively [ibid., xiii, p. 127].

True mildew of the vine (*Uncinula necator*) is prevalent both in the Mediterranean zone and the Anatolian plateau, causing damage on an economic scale.

Microsphaera alphitoides [ibid., xxvi, p. 363] develops every year on oaks (*Quercus pedunculata*) near Ankara, regularly forming perithecia in the autumn: these organs measure 100 to 143 μ, the conidia ranging from 28 to 36 by 16 to 20 μ and the ascospores 20 to 29 by 10 to 14 μ.

Leveillula (*Oidiopsis*) *taurica* is of great importance in Turkey, where its many hosts include potato [ibid., xxiv, p. 476], eggplant (which sustains up to 90 per cent. defoliation), chilli, lucerne, *Glycyrrhiza glabra*, *Tropaeolum majus*, *Althaea cannabina*, *Plumbago europaea*, and almost certainly *Abelmoschus* [*Hibiscus*] *esculentus*.

Flax is infected by *Oidium lini* [ibid., xxiv, p. 450], the cylindrical conidia of which measure 24 to 37 by 11 to 14 μ.

Diplocarpon rosae was found on an undetermined species of rose in its imperfect state (*Marssonina rosae*), the conidia measuring 15 to 23 by 6 to 11 μ.

N. İyriboz reported in 1941 that *Claviceps purpurea* was of rare occurrence on rye in Turkey, but in 1943 O. Tosun collected numerous ergot sclerotia on the F_1 progeny of spontaneous rye × wheat hybrids at Ankara.

Polystigma rubrum is very widely distributed on plums [ibid., xxv, p. 457] and almonds, the latter including *Amygdalus* [*Prunus*] *webbii*.

According to N. İyriboz (1938) *Rosellinia necatrix* is a common agent of root rot in vineyards. Presumably this is also the fungus responsible for heavy losses in the Sari Lop fig variety (the well-known 'Smyrna fig' of commerce), but fruit bodies were not available for determination.

Mycosphaerella fragariae was frequently observed on cultivated strawberries in the Izmir and Ankara districts. *M. sentina* occurs on pears [ibid., xxvi, p. 64] throughout the country.

Some of the information assembled on apple, pear, and loquat scab (*Venturia inaequalis*, *V. pirina*, and *V. inaequalis* [*Fusicladium dendriticum*] var. *eriobotryae*) has already been published [ibid., xxv, p. 373]. The perithecia of *V. pirina* mature in the Ankara district from February to early April [cf. ibid., xxv, p. 399], and the first ascospore discharge in 1942 occurred on 24th April and in 1944 on the 13th, both wet days. Viable conidia were found through the summer in one- and two-year-old scab lesions on the branches. The segregation of *V. pirina* into morphological races [ibid., xvi, p. 618 *et passim*] was corroborated. Scab losses may be heavy in wet seasons.

Leptosphaeria salvinii was found to be prevalent on rice in the sclerotial state (*Sclerotium oryzae*) [ibid., xiii, p. 322] only, this being apparently the first record of its occurrence in the Near East. The indigenous Pembe Gomlek variety was observed to be very susceptible, but the damage caused by the fungus seems to be generally inconsiderable. Another rice pathogen new to Turkey is *Ophiobolus miyabeanus* in the conidial state, *Helminthosporium oryzae*. The conidia are 3- to 10-, mostly 7- to 8-septate and measure 13 to 102 by 10 to 16 (average 60 to 70 by 12·5) μ and are thus even more minute than the otherwise similar small-spored Japanese form described by Wollenweber in Part II of Sorauer's 'Handbook of plant diseases' (fifth revised edition) [ibid., xi, p. 527]. In pure culture the fungus grew almost equally well at 20° to 25° and 25° to 30° C., but its development was noticeably retarded at 15° to 20°.

Valsa cincta [ibid., xxii, p. 41] is very widely distributed on dry apricot branches in the pycnidial state (*Cytospora cincta*). The fungus, not hitherto reported from Turkey, is thought to play only a secondary part in the die-back of trees weakened by extremes of frost and drought.

The conidial state of *Sclerotinia fructigena* was collected in a number of localities on peach, apple, quince, and pear, while *S. laxa* stat. conid. is found annually on apricots suffering from die-back [ibid., xxii, p. 71].

Plant pathology, plant physiology, entomology, and vegetable crops.—*Rep. Hawaii agric. Exp. Sta., 1944–1946*, pp. 67–145, 3 figs., 1947.

The following items of interest are in this report [cf. *R.A.M.*, xxiii, p. 7]. J. W. Hendrix (pp. 101–102) reports that the technique for testing segregating populations of tomatoes for resistance to grey leaf spot (*Stemphylium solani*) [ibid., xxv, p. 143] has been modified, a standardized inoculum of conidia replacing the mycelial suspension which was found to be unsatisfactory. The cultures produced few or no spores under a variety of ordinary conditions, but when subjected to ultraviolet rays for two minutes (Sterilamp model WL-44, with WL-782-30 Sterilamp

globe, at 15 cm. distance) increased sporulation for inoculating purposes was obtained. Twenty single spore isolates of *S. solani*, applied as mycelial suspensions to Bounty, Pan America, Pritchard, and Rutgers tomato plants, showed the same range of pathogenicity on all four varieties. Culture No. 419 with a rating of 4·6 (5 denotes complete defoliation) proved to be the most pathogenic, No. 431 with 2·9 least so.

The same author in conjunction with W. A. FRAZIER, K. KIKUTA, and J. S. McFARLANE (pp. 141–143) developed hybrids resistant to spotted wilt [tomato spotted wilt virus], grey leaf spot, and *Fusarium* wilt [*Fusarium bulbigenum* var. *lycopersici*: loc. cit. and ibid., xxvi, p. 472 *et seq*.]. The testing technique for each line was as follows: seeds were sown in sterilized soil, watered with *Fusarium*-oat inoculum (25 c.c. inoculum to 200 c.c. water), and covered with soil. After 12 days a spore suspension of *S. solani* was sprayed over the cotyledons and the plants placed in a humidity chamber for about 48 hours. Grey leaf spot lesions were observed within 24 hours after removal from the chamber and the infected plants eliminated. After four to eight days the roots were dipped in *Fusarium*-inoculum and the transplated seedlings placed in shade for two to five days, then moved to the spotted wilt nursery where, after three or four weeks, the *Fusarium* and spotted wilt-susceptibles and those of inferior quality were destroyed. Since resistance to each of the three diseases appears to depend on single, dominant genes, it is important to test F_3 selections for homozygous resistance to any one or a combination of the diseases. Some F_3 lines, in which the F_1 and F_2 generation were given the three-way resistance test described, have shown remarkable resistance to all three diseases. In one line, secured by repeated back-crosses to Bounty, there appears to be a marked tendency for grey leaf spot-susceptible plants to be susceptible to *Fusarium* and the resistant plants to be resistant to both. Though the association is by no means complete, it may be important, because the elimination of grey leaf spot-susceptibles in the cotyledon stage may include a relatively high proportion of *Fusarium*-susceptibles. No breeding material resistant to *Alternaria solani* being available, some tolerant lines from the United States were used to procure hybrids with the combined resistance (grey leaf spot, spotted wilt, and *Fusarium*) lines.

Eight fungicides were tested in seven spray applications by J. W. HENDRIX, M. MATSUURA, and K. KIKUTA in 1945 on the HES 1516 selection of Pearl Harbor tomato for the control of *S. solani*. All plants treated with fungicide with the exception of Bordeaux mixture gave significantly higher yields than the untreated, the highest being those treated with zerlate (2 lb. to 100 gals.) 25·21 tons per acre, fermate (2–100) 23·96, dithane+zinc sulphate+lime ($1\frac{1}{2}$–1–$\frac{1}{2}$) 23·65, tribasic copper sulphate 22·27, the controls yielding 17·44. Only dithane (at the first application) and Bordeaux (throughout the spray period) caused injuries to the plants.

D. D. JENSEN reports (p. 67) a new virus disease of papaw named 'ringspot' was discovered in March 1945 on the windward side of the island Oahu in the vicinity of Kailua, and scattered diseased plants were also found in Honolulu. The affected trees showed yellow rings on the colouring, mature fruits, a mosaic and dwarfing of the leaf lamina, stunting of the trees, decrease in size of fruits, and a reduced yield. *Myzus persicae*, the most common aphid on papaya, is the most efficient vector, and three species of *Aphis* also transmitted the virus. Field studies by R. C. LINDER, W. IKEDA, and M. AWADA (pp. 118–119) showed that vigorous trees were most easily infected. The disease spreads rapidly during the cooler months, and slowly during the hot and dry periods. Papaw production in the severely infected Kailua area suffered almost total losses. Eradication of affected plants has apparently prevented a recurrence of the disease.

Investigations of seed and mechanical transmission of papaw ring spot by J. W. HENDRIX and M. MATSUURA revealed that seedlings from 1,000 seeds from

diseased trees and 1,000 from healthy ones showed no difference in appearance. Transplanted to the field no evidence of the disease appeared after three months, and the virus did not spread from artificially infected soil to the growing seedlings. Mechanical transmission to healthy trees was secured by injection and rubbing with infected sap, symptoms appearing in 12 to 18 days.

Resistance to tobacco [ibid., xxvi, p. 35] and cucumber mosaic viruses in tomato has been investigated by K. Kikuta and W. A. Frazier (pp. 140–141) in several field tests. *Lycopersicon hirsutum* has shown no mosaic symptoms in the field. The F_1 hybrids between (Michigan State Forcing × *L. peruvianum*) × *L. pimpinellifolium* and *L. hirsutum*, and between Pan America and *L. hirsutum* developed mild mosaic symptoms under field conditions. The F_1 hybrid between (*L. hirsutum* × Bonny Best) × (Bounty × BC–10) and *L. peruvianum* showed some degree of tolerance, and two F_2 segregates from a cross between (*L. hirsutum* × Bonny Best × Bonny Best) and Pearl Harbor × (*L. esculentum* × *L. pimpinellifolium* × *L. chilense*) showed the highest degree of tolerance to mosaic.

Pole green beans [*Phaseolus* sp.] resistant to rust [*Uromyces appendiculatus*: ibid., xxvi, p. 325] have been bred at Makawao on Maui by W. A. Frazier and J. W. Hendrix (p. 143) during artificially induced rust epidemics, HES 494, 538, and 574 being the most promising lines.

Several cucumber varieties, resistant to cucumber mosaic virus [ibid., xxvi, p. 279], have been grown in observation plots by W. A. Frazier (p. 144). Kansas 6411, Puerto Rico 39, and Burpee Hybrid have been the most promising for tolerance to mosaic.

K. Kikuta reports (pp. 144–145) that the most destructive [chilli] pepper disease on the islands is mosaic [cf. ibid., xxii, p. 275; xxvi, p. 525] causing sometimes 100 per cent. infection in the fields. Several varieties reported to be resistant to tobacco mosaic proved susceptible to the local mosaic strain. Puerto Rico Selection 25 was very susceptible, Tabasco, Red Chili, and Small Chili being somewhat tolerant. A field selection 'Waialua' apparently highly tolerant to the pepper strain is susceptible to tobacco mosaic virus. Hybrids between the Waialua variety and the tobacco mosaic resistant Princeton have been produced and tests are in progress.

Of the 125 U.S.D.A. and Wisconsin new potato varieties and seedlings listed for resistance to early and late blight [*Alternaria solani* and *Phytophthora infestans*] at the Poamoho Experimental Farm and the Haleakala Branch Station, 30 selections showed resistance or tolerance to early and/or late blight. The most promising was B 70–5, an unnamed U.S.D.A. seedling which has been tested for two years on Oahu, Maui, and Hawaii. It produced a large yield of good-quality potatoes and was highly resistant to late blight, but extremely susceptible to early blight. One selection from a cross between Mohawk and 96–56 has been resistant to both early and late blight.

J. W. Hendrix (pp. 102–103) describes a leaf spot of lettuce, caused probably by a species of (?) *Stemphylium*. In 1945, in the vicinity of Waimea it destroyed about 75 per cent. of the crop during February, March, and April. The same disease occurred later in the Volcano district and at the University Farm, Oahu. The infected plants showed small, somewhat sunken, light brown, circular spots (1·5 to 3 mm. in diameter) on the outer leaves and exposed midribs. Favoured by the warm, wet weather the disease spread rapidly. With the onset of drier weather, plants in pre-head stage, even if heavily spotted, were able to recover, but older plants were defoliated and killed. Single-spore isolations of the fungus showed a higher degree of virulence.

A fungus also probably a species of *Stemphylium* was responsible for a leaf spot disease of pigeon peas (*Cajanus cajan*) in the early spring of 1945 on Maui and Oahu. The mycelium obtained from single spores and spore suspensions in greenhouse

tests caused severe spotting and defoliation. Mauritius was among the more susceptible varieties.

J. W. Hendrix, M. Matsuura, and K. Kikuta (pp. 104–107) used Bliss Triumph potatoes infected with early blight (*Alternaria solani*) for spray treatments with yellow cuprocide, tribasic copper sulphate, and spray-cop; the yields of 155, 159, and 161 bags per acre, respectively, were slightly better than the control (143) whereas zerlate, fermate, and dithane with 203, 218, and 212 bags, respectively, were significantly better.

Ten flowering branches of eight mango trees of four different varieties were sprayed with various fungicides at Poamoho, Oahu, in early spring of 1946. All the fungicides, applied five times, tended to reduce anthracnose [*Glomerella cingulata*: ibid., xx, p. 27; xxi, p. 504] loss. The numbers of fruits reaching maturity without evidence of anthracnose were, using phygon, 36; puratized N5 E, 28; isothan Q15, 25; fermate, 25; zerlate, 24; yellow cuprocide, 18; dithane, 13; control, 6.

Seven fungicides were tested under greenhouse conditions for effectiveness in preventing damping-off of papaw seedlings for which 100 seeds of inbred Line No. 5 of the Solo papaw were used. The seedling emergence for phygon was 800; Dow 9B, 718; spergon, 716; semesan, 698; arasan, 658; yellow cuprous oxide, 608; zerlate, 532; and control 578. Post-emergence damping-off during a 20-day period was 0, 23, 10, 35, 6, 2, 7, and 124, respectively. Zerlate delayed emergence and retarded growth. A second test was conducted in January, 1946, using the same fungicides and the same line seeds. Phygon, Dow 9B, and spergon again improved emergence percentages and post-emergence damping-off, the stand counts three weeks after emergence being, 856, 826, and 782, respectively (untreated 701).

Havas (L. J.). **L'évolution graduelle d'anomalies morphologiques y compris la polyploidie, induites chez le Pelargonium zonale par inoculations répétées du Bacterium tumefaciens.** [The gradual evolution of morphological anomalies, including polyploidy, induced in *Pelargonium zonale* by repeated inoculations with *Bacterium tumefaciens*.]—*Bull. Acad. Belg. Cl. Sci.*, Sér. 5, xxviii, 4–6, pp. 318–340, 4 figs., 1942. [Received August, 1947.]

At the Laboratory of Pathological Anatomy, University of Brussels, slips of the Metax (Meteor Atkinson) variety of *Pelargonium zonale* from asexually propagated parent stocks were inoculated in three series of tests (September, 1932, September, 1933, and May, 1936) with massive doses of virulent cultures of *Bacterium tumefaciens*. During the ten years following the first inoculation, the plants underwent a gradual transformation and segregation into two main types, morphologically and physiologically divergent. One of these, evidently an expression of auto- or allopolyploidy, reproduced the essential characters of gigantism, the plants becoming tetraploid and in some cases producing ascidiform leaves. The other type was marked by the excessive length and fragility and partial plesiasma of the stems (Fermond's term for the arrangement of the internodes in serried rows a few millimetres in length alternating with very long intervening spaces). Some of the plants thus affected also lost their negative geotropism and assumed a 'weeping' habit. Since these individuals remained diploid, the anomalies of growth are presumed to originate in a somatic mutation of the genes.

In a control series of inoculation experiments, using attenuated cultures of *Bact. tumefaciens*, heteroauxin, methylcholanthrene, and colchicine, effects similar to the foregoing were obtained, suggesting that the presence of the pathogen in a virulent form is not an indispensable condition for the development of the changes described. The latter are attributed, to a large extent at any rate, to the action of endogenous growth hormones [cf. *R.A.M.*, xvii, p. 661].

Garcés (C.). **La escoba de bruja del Cacao.** [Witches' broom of Cacao.]—*Rev. Fac. Agron. Medellin*, vi, 24, pp. 329–369, 1946.

This is a survey of the outstanding contributions to the literature on witches' broom of cacao [*Marasmius perniciosus*], arranged under the headings of host range, varietal susceptibility, terminology, history, geographical distribution, economic importance, symptomatology, etiology, epiphytology, and control by (*a*) exclusion, (*b*) eradication, (*c*) protection, and (*d*) immunization [*R.A.M.*, xvii, p. 801 *et passim*]. A bibliography of 65 titles is appended.

Crowdy (S. H.). **Observations on the pathogenicity of Calonectria rigidiuscula (Berk. & Br.) Sacc. on Theobroma cacao L.**—*Ann. appl. Biol.*, xxxiv, 1, pp. 45–59, 2 pl., 1947.

Infection by *Calonectria rigidiuscula* [*R.A.M.*, xxv, p. 548] is associated with four disorders of cacao in West Africa; canker (*Phytophthora palmivora*) [ibid., xxvi, p. 238]; injury by the capsids *Sahlbergella singularis* and *Distantiella theobroma* [ibid., xxvi, p. 190]; and acute and chronic die-back [ibid., xxi, p. 409]. Acute die-back caused a considerable amount of damage during 1944–5 in the Gold Coast. It is very destructive and has not apparently been reported before in the colony. The fungi most commonly recovered from affected trees were *C. rigidiuscula* and *Botryodiplodia theobromae* but as acute die-back occurs only after exceptional drought it may be considered to be due primarily to lack of moisture. Only *C. rigidiuscula* is present in the claret-coloured area of recently infected xylem of trees suffering from chronic die-back, typical symptoms of which are associated with trees already severely damaged either by acute die-back, capsid attack, or the falling of large forest trees. Canker affects the peripheral tissues of old trunks. In both the Gold Coast and Surinam, *C. rigidiuscula* infection is characterized by marked discoloration of the xylem in cankers caused primarily by *P. palmivora* and retards the healing of the cankers. Stems of all ages were artificially inoculated with pure cultures of *C. rigidiuscula*; they were successful only in wounded stems and in these the fungus established itself easily. Six months after mature stems had been inoculated healing was less advanced than in the uninoculated, but the presence of the fungus appeared only to check the development of the callus tissue. In one set of inoculations less than half the infected lesions were occluded after eight months, whereas in the controls all were occluded. Younger stems ($\frac{1}{2}$ to $1\frac{1}{2}$ in. diam.) were inoculated by the insertion of conidia beneath a raised patch of bark which was afterwards bound back into place. Inoculation killed the bark patch in all, compared with 54 per cent. killed in the controls. In many cases the wood lesions had been occluded and the healing completed after seven months. Needle inoculations of soft green stems with spore suspensions caused tissue necrosis and blisters around the puncture with a marked discoloration of the xylem tissues. The presence of *C. rigidiuscula* in infected capsid lesions on woody shoots caused the damage to spread from the peripheral tissues to the xylem and phloem [ibid., xxv, p. 548]. Eventually the tissues die and the lesions callus over.

In the early stages of acute die-back the part played by *C. rigidiuscula* appears to be that of a mild parasite in a weakened tree and it assumes primary importance only after the acute phase of the disease has passed, when the fungus continues to spread slowly in the healthy wood. Many infected cankers even on a vigorous tree may cause serious harm once the fungus reaches the xylem. Chronic die-back appears to be the end stage of *C. rigidiuscula* infection. Its development is almost inevitable once the tree has been weakened either by infected capsid attack, acute die-back, or infected canker, and the fungus has gained entry. Dead wood should be destroyed to reduce the reservoir of infection in the field.

BAKER (R. E. D.) & DALE (W. T.). **Notes on a virus disease of Cacao.**—*Ann. appl. Biol.*, xxxiv, 1, pp. 60–65, 1 pl., 5 diags., 1 map, 1947.

The symptoms and distribution of the virus disease of cacao in Trinidad have been described previously [cf. *R.A.M.*, xxvi, p. 48]. Recent observations indicate that the disease may cause both die-back and a reduction in yield. Although the rate of spread may vary somewhat, after 10 months an average increase of 41 per cent. over the original number of infected trees had occurred. Clone I.C.S. 6 can be used as a differential host for identifying the two strains of the virus [loc. cit.], strain A causing red mottle only and B producing mosaic as well as mottle.

Both strains were readily transmitted by budding, the incubation period varying from 34 to 136 (average 90) days. At present there is little reason to believe that any cacao varieties are immune or even symptomless carriers.

SPRAGUE (R.). **Additional parasitic fungi on cereals and grasses in Washington.**—*Plant Dis. Reptr*, xxxi, 6, pp. 240–242, 1947. [Mimeographed.]

Among the root-invading fungi isolated from the roots of Gramineae during the spring of 1947 from collections made in eight counties of eastern Washington the most prevalent was *Fusarium nivale* [*Calonectria graminicola*: *R.A.M.*, xxv, p. 552]. *Pythium arrhenomanes* [ibid., xxv, p. 299], not previously reported from the State, was isolated from the roots of winter wheat. A partial list of the isolations and some miscellaneous collections representing additions to the flora of the State, is appended.

SEMPIO (C.). **Sulla resistenza agli attacchi di Erysiphe graminis tritici offerta dall' Avena, dal Granoturco e dal Frumento esposto a luce continua.** [On the resistance to the attacks of *Erysiphe graminis tritici* offered by Oats, Maize, and by Wheat exposed to continuous illumination.]—*Riv. Biol.*, xxxvi, pp. 43–66, 11 figs., 1943. [Received 1946.]

On a red Swedish variety (Segrahavre) of oats used in the author's experiments at the University of Perugia, the conidia of *Erysiphe graminis tritici* germinated less profusely than on wheat, and the germ-tubes were shorter, contorted, and characteristically bifurcated at the apex, representing a typical case of preventive defensive action. The very small haustoria penetrating the epidermal cells underwent rapid degeneration in consequence of an immediate violent reaction on the part of the host, consisting in the release of specific toxins, either already present in its cytoplasm or, more probably, secreted at the moment of invasion, and in a process of phagocytosis by the host nucleus, accompanied by extensive chromatic changes in the latter. The rapid death and disintegration of the haustoria were followed by similar manifestations in the infected and adjacent host cells, appearing in the next three or four days in the form of small, brown, elongated spots in the epidermal layers and mesophyll of some of the leaves.

An indigenous variety of maize proved to be absolutely refractory to infection by *E. g. tritici*. Although the conidia germinated rather more abundantly than on wheat, there was no sign whatever of haustoria in the epidermal cells or even of necrotic spots at the site of inoculation.

Virgilio wheat exposed to continuous irradiation (*ca* 2,000 kW.) displayed the same type of preventive defence as oats [*R.A.M.*, xviii, p. 471]. However, the necrotic lesions developing on the latter host as a sequel to infection were absent on the former, indicating that the high degree of resistance acquired artificially by wheat through the action of light is not comparable with the congenital immunity of oats.

LATHBURY (R. J.). **The development of Wheat varieties in Kenya.**—*Emp. J. exp. Agric.*, xv, 59, pp. 177–188, 1947.

All wheats in Kenya, irrespective of the altitude at which they are grown, should possess resistance to stem [black] rust (*Puccinia graminis*) and leaf [brown] rust [*P. triticina*] and to yellow rust (*P. glumarum*) at the higher altitudes (over 7,000 ft.). This paper outlines the progress of the diseases in the country since they first appeared, describes the discovery of fresh physiologic races of *P. graminis tritici*, and outlines the progress made in breeding for resistance to this disease. The seventh physiologic race, K 7 [cf. *R.A.M.*, xx, p. 560], was isolated in 1943 and has so far been found only in breeding cages although reported from the field in Tanganyika in 1945. Wheat is grown over most of the year, *P. graminis* seemingly maintaining itself through the uredospore stage. It is considered possible that wind-blown spores from Abyssinia might account for the presence of new races.

The Canadian wheats Regent RL 975.6 and Apex RL 1857, possessing mature plant resistance in Canada, are also resistant to most of the Kenya races of *P. graminis* in the seedling stage. Of the more recent crosses of importance No. 291 (Australian 26. A×58. F. (L. 1)) has several good qualities for medium altitudes up to 7,000 ft., and one strain bred from it (291. J 1. I 1) is resistant to all seven races of *P. graminis*; No. 294 (Australian 26. A×117. A), suitable for altitudes up to 8,000 ft., yields well and has produced several rust-resistant strains and No. 261 (Kabete hybrid×Reliance) has yielded some early-maturing strains which, though slightly susceptible to race K 7, produce grain of good quality and are particularly suited to the lower areas requiring quick-maturing wheats. In addition an early-maturing Kabete hybrid, No. 192. Q. 2. A. (L), of unknown origin, is useful in the lower areas for its resistance and good grain quality.

ROSEN (H. R.). **Breeding Wheat to combine resistance to leaf rust, speckled leaf blotch, and glume blotch.**—*Phytopathology*, xxxvii, 7, pp. 524–527, 1947.

During the past decade or two the acreage of wheat in Arkansas has been reduced, largely through the prevalence of leaf [brown] rust (*Puccinia rubigo-vera* var. *tritici*) [*P. triticina*], speckled leaf blotch (*Septoria tritici*) [*R.A.M.*, xxiv, p. 281; xxv, pp. 155, 301], and glume blotch (*S. nodorum*) [ibid., xviii, p. 661]. In 1941 the breeding of wheat for resistance to these diseases was initiated, mainly with a view to winter pasturage and grain feed supplies. One of the wheats under investigation at the University Farm, Fayetteville, Fultz Sel.×Hungarian, C.I. 12017, showed less brown rust than any named variety, though nearly all the plants bore a few fairly large pustules (3 to 4 type) denoting a susceptible reaction. However, the occasional pustule-free individuals appeared not only resistant to *P. triticina* but were less affected by *S. tritici* and *S. nodorum* than the other varieties under cultivation.

Three successive series of selections from these plants culminated in 1946 in a higher and more uniform type of resistance to brown rust and glume blotch and somewhat greater resistance to speckled leaf blotch in the bulk of the progeny as compared with C.I. 12017. Thus, 25 out of 37 selections gave a lower and more uniform rust reading than the original. On 25th April, when Purplestraw and Sanford, used as controls, showed 35 to 50 per cent. infection by *P. triticina*, in none of the selections did the incidence exceed a trace. On 18th to 20th May, when 90 per cent. of the upper blades of the two varieties were occupied by brown rust pustules and the lower blades were dead, mostly through the combined action of speckled leaf blotch and brown rust, the maximum reading obtained on C.I. 12017 and its derivatives was 20 per cent. Comparative determinations by K. S. Chester of the reactions to eight race groups of brown rust [ibid., xxvi, p. 239] of selection 12017–24–2, C.I. 12017, and Sanford showed the first-named to be resistant to 6, 9,

12, 21, 45, and 65 and intermediate in response to 2 and 5; the parent was resistant to 6, 9, 12, and 65, intermediate to resistant to 21, intermediate to susceptible to 2 and 5, and showed confused reactions to 45; while Sanford was resistant to 12 and 45, susceptible to 5, 6, 9, 21, and 65, and gave conflicting responses to 2. Of particular interest in relation to future breeding work is the resistance of the soft red 12017–24–2 to the widely aggressive race group 21. The selections here described have not been investigated for their reactions to bunt [*Tilletia caries* and *T. foetida*], both of which are usually of minor importance in Arkansas.

A promising outlook for combined resistance to *P. triticina* and *S.* spp. is further offered by the cross (Red Rock × Hope) × C.I. 12017, the lines of which, however, are still segregating in the F_4.

KRISTEV (K. K.). Твърдата главня Пшеницата в България и създаване на сортове, устойчиви на тази болест. [Bunt of Wheat in Bulgaria and breeding of bunt-resistant varieties.]—*Annu. Univ. Sofia*, xxiv, 1, pp. 405–475, 2 figs., 1946. [English summary.]

Continuing his studies on wheat bunt in Bulgaria [*R.A.M.*, xvi, p. 305], the author describes the biology and distribution in Bulgaria of the causal fungi *Tilletia levis* [*T. foetida*] and *T. tritici* [*T. caries*]. The spores of the latter did not germinate in nutrient media. *T. foetida* is found throughout the country, while *T. caries* occurs in the Vidin and Belogradchik districts, in the surroundings of Stara-Planina, in the Botevgrad district, and in areas in north Bulgaria, in the Rousse district, and traces in the Sofia, Elhovo, and Varna districts.

Using 15 test wheat varieties, bunt originating from 45 sources was shown to be of two physiologic races of *T. foetida*. Race I severely infected Hussar, Relief, Martin, White Odessa, and Rex which were immune from, or resistant to, race II. The races also differed in physiological reactions (minimum temperature for development and change of colour produced in the media) and in morphological characters (length of the promycelium, size of the chlamydospores, and shortening of the stem of the infected plant). Race I occurs predominantly in western Bulgaria with the exception of two isolated areas in Karlovo and Rousse-Obrastzov Tchiflik, whereas race II is distributed throughout the north and south. Comparing the two races with those described in the literature, the author suggests that they are the same as races found in Germany and the United States. Tests showed that none of the Bulgarian wheat varieties was resistant to the two races, but Balvan 5 was highly resistant to race I. Of the foreign varieties tested, Hosar was fully immune and Ridit and Hope highly resistant to both races.

POPP (W.). **A rapid method of examining Wheat heads for bunt infection.**—*Phytopathology*, xxxvii, 6, pp. 418–420, 1 fig., 1947.

The simple, rapid, and accurate method in use at the Dominion Laboratory of Plant Pathology, Winnipeg, Canada, for the examination of wheat heads for bunt (*Tilletia caries* and *T. foetida*) is based on the observation that the disease is more conspicuous in a ripening stand immediately after drenching rain. The heads are first soaked in water, either overnight at or near boiling-point or with the addition of a wetting agent for 24 hours at room temperature, and inspected in a good light while still wet. The contrast in the infected heads before and after immersion is very marked, the bunt balls, which swell and turn much darker while soaking, usually being recognizable either through or between the now semi-transparent and extended glumes. Since hot water destroys the spores it should only be used when the material is not required for inoculation or a wetting agent is not available.

In a test in which 20 wheat varieties were inoculated separately with the two smuts, 10,147 of the total of 68,000 heads (14·9 per cent.) were graded as infected when examined in the dry state compared with 12,558 (18·5) inspected after immer-

sion. It was commonly found in certain varieties that only one or two kernels or occasionally part of a kernel in a head had contracted infection. Of 3,400 heads of Regent, one of the varieties affected in this way, bunt could be detected in only 34 (1 per cent.) when the heads, but not the individual spikelets, were examined dry, as against 100 (2·9) after immersion. In practice it has been found that up to 2,500 heads of wheat can be examined by one person in an hour using the method described.

URION (E.) & HANUS (J.). **Malt and beer from Barley affected by smut.**—*Brasseur franc., 1947*, 5, pp. 7–9, 1947. [French. Abs. in *J. Inst. Brew.*, N.S., xliv, 4, p. 210, 1947.]

Barley samples from crops attacked by covered smut [*Ustilago hordei*] become thickly dusted with spores during threshing and subsequent handling, and the resultant greyish tinge would normally involve their rejection by maltsters. In periods of short supply of barley, however, such samples might be accepted, and an investigation was accordingly made to determine the possible effects on the beer of smut infection of the grain. Laboratory tests on batches from a heavily contaminated lot of 100 quintals [1 quintal = 100 kg.] showed that a dry brushing readily detached the bulk of the spores, as also did washing with water, which was turned grey. The entire sample was then cleaned and screened in the ordinary way, followed by steeping, the second and third liquors containing lime water. The finished malt was somewhat overgrown but not otherwise remarkable, and the flavour of the beer brewed from it was perfectly normal.

LIVINGSTON (J. E.). **Barley fertilizer and seed treatment test.**—*Phytopathology*, xxxvii, 6, pp. 426–428, 1947.

Test plots, 100 by 4 ft., were laid down in 1945 and 1946 to determine the combined effect of fertilizers and seed treatment on barley root rot of unknown origin, a severe outbreak of which in 1943 caused a heavy reduction in the Nebraska crop. In 1945 the experiments were conducted in Merrick County on sandy loam of low fertility, and in 1946 in Hall and Buffalo Counties on moderately fertile soil of the same type. The nitrogen-phosphorus-potassium soil amendments were applied in the following ratios: none, 0–30–0, 20–0–0, and 20–30–0, four replications of each being planted with certified Spartan barley treated with new improved ceresan (½ oz. per bush.) and four with untreated seed. In 1945 seed disinfection conferred no appreciable benefit except in combination with the nitrogen (uramon)-phosphorus (45 per cent. superphosphate) fertilizer, the joint treatment increasing the bushel yield per acre from 11·5 to 24. Even by itself the nitrogen-phosphorus amendment gave a high yield (19·2 bush. per acre). In 1946 nitrogen, both alone and combined with phosphorus, significantly augmented yields, with or without seed treatment, which by itself was ineffectual.

COOPER (W. E.). **Sclerospora macrospora on Oats in Louisiana.**—*Plant Dis. Reptr*, xxxi, 7, p. 270, 1947. [Mimeographed.]

Oats of the selection C.I. 4316 infected with *Sclerospora macrospora* [*R.A.M.*, xxiv, p. 14] were collected in late May, 1947, at Crowley, Louisiana, where the disease has not been reported previously. The symptoms, spore characteristics, and measurements closely agreed with those given by Miles and Epps [ibid., xxii, p. 62].

LEUKEL (R. W.) & POLLACK (FLORA G.). **Periconia circinata (Mangin) Sacc. as a possible causal factor in Milo disease.**—Abs. in *Phytopathology*, xxxvii, 6, p. 440, 1947.

Isolations from the roots of Colby milo [sorghum] grown in soil from [? Cali-

fornian] fields naturally infested with the agent of milo disease [*R.A.M.*, xxii, p. 101] frequently yielded a fungus with a dark mycelium producing either numerous conidia or thick-walled, catenulate chlamydospores, which was identified as *Periconia circinata* [ibid., xviii, p. 809]. Heavy inoculation with the organism in steamed soil caused severe injury to Dwarf Yellow and Colby, both susceptible to milo disease, but was without apparent effect on the resistant varieties. In less heavily inoculated soils susceptible plants were stunted, had small heads or none, and died considerably earlier than those of resistant varieties grown in the same plots. The susceptible plants were similar in many ways to those grown in soil naturally infested with the milo disease organism. *P. circinata* may, therefore, be a contributory factor to the disease.

THIRUMALACHAR (M. J.) & MUNDKUR (B. B.). **Morphology and the mode of transmission of the Ragi smut.**—*Phytopathology*, xxxvii, 7, pp. 481–486, 2 figs., 1947.

Sections of very young, ovariicolous sori of the smut of *Eleusine coracana* caused by *Melanopsichium eleusinis* [*R.A.M.*, xxvi, p. 266], which is widespread in the Mysore, Bombay, and Madras Provinces, indicate that the fungus forms locular sori in lysigenous cavities. The sorus transforms the ovary into a gall six or seven times the normal size of the grain. The subglobose to spherical, yellowish-brown, verruculose spores, 7 to 11 (mean 9·6) μ are formed centripetally. They germinate readily, producing primary and secondary ovate to cylindrical, uninucleate, thin-walled, biguttulate sporidia, conjugation between which was not observed. The chlamydospores of *M. eleusinis* form small, white colonies on potato dextrose agar within three or four days. Mycelial production is scanty, but secondary sporidia develop rapidly.

The smut was shown by inoculation experiments not to be carried in or on the seed. The application to ears just emerging from the sheath of sporidial or chlamydospore suspensions resulted in some 13 per cent. contamination of the plants, indicating that floral infection occurs at an early stage and that the pathogen is probably air-borne.

SIEGLER (E. A.) & CHILDS (J. F. L.). **Isopropanol-soluble compounds in controlling stem-end decay of Oranges.**—*Phytopathology*, xxxvii, 6, pp. 399–402, 1947.

In a limited series of tests in Florida from April to July, 1946, the amount of stem-end rot of Valencia oranges (*Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) [*R.A.M.*, xxv, p. 212 and next abstract] appearing after three weeks' storage at 70° F. was reduced from 45·9 to 4·3 and 2·5 per cent., respectively, by a 30-second pre-storage dip in either 5 per cent. diphenyl sulphoxide or 5 per cent. benzhydrol, both in 100 per cent. isopropanol. At 2·5 per cent. in 50 per cent. isopropanol, diphenyl sulphoxide and benzhydrol reduced the incidence of infection from 41·4 to 8·2 and 3·8 per cent., respectively. Even better results were given by two to five seconds' immersion of the fruits in 5 per cent. phenylurethane in 100 per cent. isopropanol, which reduced the amount of stem-end rot from 34 to 1 per cent. In another series, using the solvent at 50 per cent., the reduction effected by 5 per cent. phenylurethane was from 40·2 to 1·1 per cent. In a single test in which diphenyl sulphoxide, benzhydrol, and phenylurethane, all at 5 per cent., were incorporated in a light summer oil and applied to oranges by the dip method, the incidence of stem-end rot was reduced from 22 to 10·2, 11·1, and 2·4 per cent., respectively. The rind burn caused by diphenyl sulphoxide was of moderate extent and that due to benzhydrol rather severe, while phenylurethane was responsible only for slight burns where the oil had gathered at points of contact between fruits.

Hildebrand (E. M.). **Stem-end rot fungi attacking immature Citrus fruit.**—Abs. in *Phytopathology*, xxxvii, 6, p. 433, 1947.

Florida oranges, grapefruit, and tangerines were found to develop infection by the causal organisms of stem-end rot (*Phomopsis* [*Diaporthe*] *citri* and *Diplodia natalensis*) [*R.A.M.*, xxvi, p. 449 and preceding abstract] only on their removal from the trees, being open to contamination by the pathogens from shortly after the blossom phase until maturity. The percentage of immature fruits developing symptoms within a month of picking increased between June and October from 20 to 70 per cent. The initial symptoms were observed on occasional fruits within a week, while on others the rots were still developing 16 weeks after removal. Histological examination of the button region of fruits of all ages demonstrated the frequent presence of hyphae of spores of the pathogens around, on, and under the calyx lobe but never below the cork layer on attached fruits. After picking, however, the fungus rapidly spreads from the outer to the deeper button tissues and thence into the fruit.

Neal (D. C.). **Observations in 1945 and 1946 on the relationship of rainfall in Louisiana to the incidence of Fusarium wilt of Cotton.**—Abs. in *Phytopathology*, xxxvii, 6, p. 435, 1947.

The rainfall at Baton Rouge, Louisiana, from May to August, 1945, slightly exceeded the 20-year average with major departures from the normal in June and August. In 1946 the same average was greatly exceeded, with wide deviations from the normal in May and July and slighter ones in June. In both years maximum temperature ranges of 90° to 97° F. occurred during these months. In 1945 wilt (*Fusarium*) [*vasinfectum*: see next abstracts] appeared early (12th June) and became progressively more severe as the season advanced, resulting in crop failures in several susceptible cotton varieties. On the contrary, in 1946 the disease was only sporadic before mid-August, even on the more susceptible varieties. The precipitation and bi-weekly wilt infection data indicate that the incidence of the disease is increased by alternating wet and dry spells during the optimum period for infection, June to August, and by rainfall slightly in excess of the 20-year average, whereas heavy rains of lengthy duration at this time are adverse to its development [cf. *R.A.M.*, xviii, 106; xxvi, p. 105].

Young (V. H.). **Relation of environment to the incidence of Fusarium wilt of Cotton.**—Abs. in *Phytopathology*, xxxvii, 6, p. 437, 1947.

No correlation was established in 192 soil samples from 11 areas of Arkansas between the pH, ranging from 4·66 to 8·4, and cotton wilt [*Fusarium vasinfectum*]. The disease was severe on potash-deficient soils [*R.A.M.*, xxi, p. 74], which tend to acidity, but the latter did not appear to be the decisive factor. The use of boron-containing soil amendments did not reduce the incidence of infection. Eighteen years' records at the Cotton Branch Experiment Station, Marianna, showed that high rainfall, especially before August, was generally correlated with greater prevalence of wilt while, conversely, the disease was less prominent in years marked by long dry spells, notably in June and July [cf. preceding abstract]. Over the five-year period from 1929 to 1933 cotton was planted at fortnightly intervals from 15th April to 1st July, resulting in a 35 per cent. average of wilted plants for the former date and 3 per cent. for the latter. High soil moisture during more of the growing season is believed to be mainly responsible for the heavier infection in the earlier sowings.

Smith (A. L.) & Ballard (W. W.). **Wilt resistance in Empire Cotton.**—Abs. in *Phytopathology*, xxxvii, 6, pp. 436–437, 1947.

The original parent plant of Empire [*R.A.M.*, xxv, p. 333], a promising cotton

variety now in the third year of commercial production [in Georgia], was re-selected in 1935 from a field planting of Stoneville 2 first selected in 1931. A number of lines have been selfed continuously since 1938, and tests of these from 1944 to 1946, inclusive, revealed a wide range of reaction to wilt [*Fusarium vasinfectum*: see preceding abstracts], extending from high susceptibility to resistance on a par with that of the best commercial varieties. The heterozygosity of the original plant expressed in these variations suggests its probable derivation from a cross between Stoneville and a wilt-resistant variety. The uniformity of the selfed lines for agronomic characters facilitated an immediate shift in production to those with a high degree of resistance.

RAMAKRISHNAN (T. S.). **Studies in the genus Colletotrichum—III.**—*Proc. Indian Acad. Sci.*, Sect. B, xxv, 1, pp. 15–27, 1 pl., 1947.

In pursuance of his studies on the genus *Colletotrichum* at the Agricultural Research Institute, Coimbatore [*R.A.M.*, xxi, p. 162], the author investigated the physiology of French bean and oat agar cultures of *C. indicum*, using isolates from cotton supplied by J. F. Dastur [ibid., xiii, p. 507]. The optimum temperature for growth was found to be about 32° C. with a minimum of 10° and maximum of 37°. Maltose and sucrose were the best sources of carbon among those tested, while peptone provided an ample supply of nitrogen. Staling products accumulated in cultures over three weeks old, filtrates of which induce the wilting of cotton seedlings in 12 hours.

C. indicum was compared with *C. capsici* from chilli [ibid., xxi, p. 363], *C. curcumae* from *Curcuria longa* [loc. cit.], and isolates of *Colletotrichum* from *Cicer arietinum* (recorded by Sundararaman as a species of *Vermicularia* [ibid., vii, p. 678]) and *Aristolochia bracteata* [ibid., xxi, p. 363]. The growth of an isolate on the tissues of a particular host for a number of generations was shown to enhance its pathogenicity to the plant in question. Thus, after five passages through sterilized cotton seed the five isolates under investigation were able to infect cotton seedlings, though not all with equal virulence or at the same rate.

The taxonomic position of the several isolates is fully discussed, with references to the relevant literature, in the light of these results, and is found to call for revision. The author finds no basis for separation in their morphological characters or pathogenic proclivities and proposes their relegation to one species under the earliest name of *Colletotrichum capsici* according to the International Rules of Botanical Nomenclature.

SCHWEIZER (G.). **Über die Kultur von Empusa muscae Cohn und anderen Entomophthoraceen auf kalt sterilisierten Nährböden.** [On the culture of *Empusa muscae* Cohn and other Entomophthoraceae on cold-sterilized nutrient media.]—*Planta*, xxxv, 1–2, pp. 132–176, 18 figs., 1947.

A comprehensive account is given of the author's methods for the culture of the fly parasite, *Empusa muscae* [*R.A.M.*, xxiv, p. 504], and other Entomophthoraceae, which have hitherto failed to make satisfactory growth as saprophytes, in enzymatically active media, e.g., meat extract gelatine with an admixture of blood or serum and glucosamin (essential to chitin formation). On such substrata these entomogenous fungi flourish and complete their life-cycles, as in the natural hosts, with an abundance of fructifications, permitting of their large-scale cultivation for biological control purposes. The conidia are germinable, for three to five days only, immediately after discharge. The germination of the resting (azygo- and zygo-) spores requires a special biocatalytic stimulus, which may be simulated in the laboratory by means of pure cultures of chitin-splitting bacteria.

DRECHSLER (C.). **Three Zoopagaceous fungi that capture and consume soil-inhabiting rhizopods.**—*Mycologia*, xxxix, 3, pp. 253–281, 8 figs., 1947.

The morphology and behaviour are described of three new members of the Zoopagaceae [*R.A.M.*, xxv, p. 342]: *Stylopage rhabdoides*, *Acaulopage ischnospora*, and *A. crobylospora*, all of which consume soil-inhabiting amoebae found on decayed vegetable matter.

DRECHSLER (C.). **Three new species of Zoopage predaceous on terricolous rhizopods.**—*Mycologia*, xxxix, 4, pp. 379–408, 7 figs., 1947.

Three new members of the Zoopagaceae [see preceding abstract], isolated from decaying plant remains, are described, *Zoopage virgispora*, *Z. pachyblasta*, and *Z. toechospora*, which capture and consume soil rhizopods.

VANTERPOOL (T. C.). **Selenophoma linicola sp. nov. on Flax in Saskatchewan.**—*Mycologia*, xxxix, 3, pp. 341–348, 4 figs., 1 pl., 1947.

A fungus belonging to the genus *Selenophoma* was first collected from dead branches and pedicels of linseed flax in Saskatchewan in 1944. It was again collected in 1945 and pre-harvest surveys in 1946 showed light infestations of the same species extending from the limit of the flax-growing area in the north of the Province to the Estevan district near the southern boundary and from the South Saskatchewan River in the centre of the Province eastward to near the Manitoba boundary. The infection was much lighter in the north, probably owing to the delayed maturity of the crops. The rapidity with which the infestation has spread among the early maturing crops indicates that it may cause great damage in the future, although at present the disease is of no economic importance on flax. Artificial inoculations of flax seed with spore suspensions caused a slight inhibition of root growth accompanied by curling and an increase in branch roots, but the suspensions caused no infection of plants in the early stages of boll development. In the field pycnidia were mostly commonly found on the early maturing Redwing, on plants already affected by other diseases, such as physiological die-back, and on the pedicels of aborted bolls. It has also been found on several other named linseed varieties.

Although the fungus resembles *S. bromigena* [*R.A.M.*, xxiv, p. 316] in certain cultural characters the latter appears to be confined to *Bromus* spp. Cross-inoculations with the two species on certain flax and grass hosts yielded no infection. The two species differ also in spore size. *S. linicola* n. sp. is described as having mostly scattered, raised pycnidia in zones 3 to 20 mm. long, usually encircling the fine branches and pedicels of flax, subepidermal, dark brown to black, flattened to globose, and measuring 110 to 140 by 85 to 110 (average 131 by 92) μ. The ostiole, about 11 by 23 μ, expands to twice this size in water after spore discharge. The pycnidiospores are unicellular, hyaline, usually vacuolate, lunate to falcate, typically 17 to 22 by 2·7 to 3 μ from natural material but larger in culture; germination is usually preceded by septation, especially on nutrient media.

SCHUSTER (M. L.) & ANDERSON (E. J.). **Seedling blight and root rot of Flax in Washington.**—*Phytopathology*, xxxvii, 7, pp. 466–473, 3 figs., 1947.

This is an amplified, tabulated account of investigations in Washington on flax seedling blight and root rot, a preliminary note on which has already appeared [*R.A.M.*, xxiv, p. 268]. *Fusarium oxysporum* was found to be the principal agent of seedling disease, having been isolated from 159 of the experimental specimens, while only eight yielded *F. solani*. The former species reduced emergence from 89 to 27 per cent. and caused pink to red, later brown, irregular root and stem lesions in 70 per cent. of the survivors. The corresponding percentages for *F. solani* were 85 and 18. The typical symptoms of the wilt due to *F. o.* f. *lini* (*F. lini*) did not develop in the susceptible Punjab variety as a result of inoculation

with *F. oxysporum*. The percentage of cracked seed in the variety Rio was 42. Seed threshed by hand gave better results in field and greenhouse tests than seed threshed by machine at medium cylinder speed, while that at high cylinder speed gave the poorest stand.

JEHLE (R. A.) & JENKINS (ANNA E.). **Diseases with scab-like symptoms observed in southern California in 1946.**—Abs. in *Phytopathology*, xxxvii, 6, pp. 439–440, 1947.

During November and December, 1946, symptoms resembling those of violet scab (*Sphaceloma violae*) [*R.A.M.*, xxvi, p. 153] were prevalent and destructive on English ivy (*Hedera helix*), *Pelargonium peltatum*, and *Schinus molle*, the two latter being extensively defoliated. The *H. helix* disease was identified as English ivy scab (*Sphaceloma hederae*) [ibid., xxvi, p. 217]. The symptoms on *P. peltatum* are reminiscent of the intumescences described on the same host by Ringuelet in 1927, as well as of oedema reported by F. C. Stewart in 1910, while (?) *Macrosporium pelargonii* [ibid., xvi, p. 537] was also present, apparently in a non-pathogenic form. The foliar lesions on *Schinus molle* are suggestive of *Sphaceloma* infection.

CRONSHEY (J. F. H.) & DILLON WESTON (W. A. R.). **A disease of Gypsophila elegans.**—*Gdnrs' Chron.*, Ser. 3, cxxii, 3168, p. 108, 1947.

This paper indicates that the disease caused by *Sclerotinia serica* on *Gypsophila elegans* [*R.A.M.*, xvi, p. 679] is seasonal in its attack and can be avoided by spring sowing. On the occasion of the first report in 1933 [loc. cit.] the crop had been sown in September, the main localized attack occurring in November. In a September sowing in another part of the same field in 1934 the disease recurred in October to November and was so severe that the crop had to be abandoned. The same strip, left unploughed, was cultivated and re-sown in the spring of 1935. A successful crop without disease was obtained. Spring sowing was then continued in most years on various strips, no disease appearing on any of the crops. From 1941 to 1943 no *Gypsophila* was grown on the field but in 1944 and 1945 two spring sowings, some 50 yards distant from the site of the previous attacks, were successful. Autumn sowing was resumed in September, 1945, on two strips adjacent to and partly overlapping those of the 1944–5 spring crops. By November, 1945, one of these was severely attacked, the other only moderately. Upon examination it was found that sclerotia were being formed abundantly in the top soil near the attacked plants and surface mycelium was conspicuous on the soil around them, and along the leaves and stems of weeds where these occurred. It was noted that the spread of the disease became very slow after January and ceased by the end of March, and by late April the surface mycelium could no longer be seen. The following year a heavily contaminated strip with drills coinciding with those of the previous autumn was sown at the end of March. No disease was observed in the crop. A small block of soil which had been lifted from the field in November, 1945, did not produce any apothecia until September, 1946. Although spring sowing practically ensures *Gypsophila* crops free from *S. serica* it cannot be recommended as a general measure as such crops miss the early market.

ORLANDO (A.) & SILBERSCHMIDT (K.). **Estudos sôbre a disseminação natural do virus da 'clorose infecciosa' das Malváceas (Abutilon virus 1. Baur) e a sua relação com o inseto-vetor 'Bemisia tabaci (Genn.)' (Homoptera-Aleyrodidae).** [Studies on the natural dissemination of the virus of 'infectious chlorosis' of the Malvaceae (*Abutilon* virus 1. Baur) and its relation with the insect vector *Bemisia tabaci* (Genn.) (Homoptera-Aleyrodidae).]—*Arq. Inst. biol., S. Paulo*, xvii, pp. 1–36, 2 diags., 1946. [English summary.]

In order to study the natural dissemination of *Abutilon* virus 1 [*Abutilon* variega-

tion virus] among plants of *Sida rhombifolia* [*R.A.M.*, xxvi, p. 256], 1,096 healthy seedlings were set out on 18th to 19th November, 1943, in four beds, in two of which rows of infected plants alternated with sound ones, while in the other two the diseased specimens were placed along one of the borders. On 16th March, 1944, only 86 (7·87 per cent.) of the plants were still healthy, whereas all those from the same sample kept in an insect-proof greenhouse were virus free on the 28th.

Three healthy *S. rhombifolia* seedlings in pots, isolated from each other and from the soil by standing on pots inverted in dishes of water covered with Paris green, developed infectious chlorosis. This led to the conclusion that the insect vector of the virus was a winged form. Negative results had been obtained in an earlier series of experiments by four methods in the transmission of the *Abutilon* variegation virus by 21 insects. In the course of these trials one of the cages containing a mixture of healthy and diseased *S. rhombifolia* was found to be infested by white flies, subsequently identified as *Bemisia tabaci*, and incipient symptoms of infectious chlorosis were observed on some of the originally sound plants. Further experiments were accordingly conducted, using first- and second-generation adults of *B. tabaci* descended from specimens collected in the cage or field and bred on diseased plants, on 29 plants of *S. rhombifolia* and 25 of *A. striatum* var. *spurium*, of which all the former and 18 (72 per cent.) of the latter contracted infection. In another series, in which the white flies were introduced into cages of mixed healthy and diseased plants, 30 out of 44 (68·18 per cent.) *S. rhombifolia* and 22 out of 27 (81·48 per cent.) *A. striatum* var. *spurium* developed infectious chlorosis. The period elapsing between the infestation of the plants by *B. tabaci* and the initial symptoms of the disease ranged from 5 to 28 days in *S. rhombifolia* and from 12 to 45 in *A. striatum* var. *spurium*. A single individual of either sex sufficed, the female, however, with 10 out of 23 *S. rhombifolia* plants (43·48 per cent.) contracting infection, being more efficient for this purpose than the male (4 out of 20 or 20 per cent.).

Using five insects (male and female) per plant, infections were secured in 14 out of 17 plants (82·35 per cent.), while all 17 exposed to infestation by ten individuals of both sexes became diseased.

The probable geographical limits of the area of natural dissemination of infectious chlorosis are outlined in relation to the spontaneous occurrence of wild Malvaceae and to the existence of *B. tabaci* in the same region.

TOMPKINS (C. M.) & TUCKER (C. M.). **Leaf blight of Pink Calla caused by Phytophthora erythroseptica.**—*Phytopathology*, xxxvii, 6, pp. 382–389, 2 figs., 1947.

Since 1938 a destructive leaf blight of the Superba calla (*Zantedeschia rehmanii*) has been prevalent in the Monterey Bay region of California. Symptoms of the disease include distortion, rapid wilting, chlorosis, and collapse of the leaves, with a soft, wet, brownish-black rot of the petioles at and slightly above and below soil-level, death of the foliage ensuing in a few days. The roots and corms are not attacked. On the basis of morphological characters and temperature-growth relations (minimum, optimum, and maximum for mycelial development, 13°, 25°, and 28° C., respectively), the fungus isolated on malt extract agar from the infected leaves was identified as *Phytophthora erythroseptica* [*R.A.M.*, x, p. 755]. The pink calla strain failed to induce the typical pink rot of potato tubers [ibid., xx, p. 32; xxiv, p. 285] but was pathogenic to its own host and yellow calla (*Z. elliottiana*) in soil inoculation tests, the incubation period averaging 25½ days. A footnote records the isolation of *P. erythroseptica* from diseased white calla (*Z. aethiopica*) in the San Francisco area. Wet, poorly drained soil and cool, foggy weather are predisposing factors in the development of the foliar blight, control of which should be effected by means of crop rotation and sanitation. This is believed to be the first record of *P. erythroseptica* as a parasite of pink calla.

CICCARONE (A.). **La coltivazione del Piretro nel Kenya.** [Pyrethrum cultivation in Kenya.]—Reprinted from *Riv. Agric. subtrop. trop.*, xl, 7–12, 21 pp., 1 diag., 1946.

In the section of this paper dealing with diseases of pyrethrum [*Chrysanthemum cinerariaefolium*: *R.A.M.*, xxvi, pp. 233, 454] in Kenya the author states that seedling rot due to *Pythium* sp. sometimes occurs. It is favoured by over-thick planting. The affected seedlings rot at the collar and lie along the ground but appear to remain healthy above the infected zone for a few days, presenting the appearance of plants that have been badly sprayed. As the host makes slow growth, infection spreads readily. The author obtained moderately good control by applying weak solutions of copper sulphate to the soil, but in practice the simplest method is to remove and burn all infected material, reduce shade, and space out the crop.

Physiological wilt is sometimes due to improper cultural methods and the affected plants may be attacked later by various fungi. There is also, however, a parasitic wilt, which in the field is often confused with other diseases. The collar region is usually disintegrated, the cortical tissues showing an abundant hyaline, septate mycelium. The base of the petiole of the lowest leaf may show a discoloured, somewhat striped area a few centimetres long. Hendrickx informed the author orally that in the higher regions of the Belgian Congo wilted pyrethrum plants yielded *Fusarium javanicum* var. *radicicola* [ibid., xiii, p. 397], the same fungus also having been observed on this host by Hopkins (*in litt.*); but in Kenya of 14 lines of *Fusarium* isolated from wilted pyrethrum by the author, while some were referable to the section *Martiella*, none resembled *F. j.* var. *radicicola*. On several occasions *Sclerotinia minor* [ibid., xix, p. 71] was isolated from infected pyrethrum material and soil.

Failure in the few attempts made at pyrethrum cultivation in [former] Italian East Africa was also associated with a wilt, apparently due to *Fusarium* spp.

Under favourable conditions of humidity and temperature the flower heads and rays develop dark spots due to *Alternaria gossypina* [ibid., xxvi, p. 14]. Infection sometimes follows infestation by *Thrips tabaci*.

SARAVI CISNEROS (R.). **Enfermedades de los bulbos de Gladiolo en almacenamiento.** [Storage diseases of *Gladiolus* corms.]—*Anu. rur. B. Aires*, xiv, pp. 209–311, 3 figs., 1946.

Some of the rots affecting stored *Gladiolus* corms in Argentina originate during the growing period and continue to develop in the warehouse. Of these the only one so far investigated in the country is the hard rot caused by *Septoria gladioli* [*R.A.M.*, xxvi, p. 340]. Storage decays proper include the dry rots due to *Penicillium* (?) *gladioli*, *Fusarium* (?) *oxysporum* var. *gladioli* [ibid., xxvi, p. 402], and a species of *Botrytis* [cf. ibid., xxvi, p. 58] the systematic position of which is still uncertain.

WILSON (C.). **Anthracnose on Blue Lupins.**—*Plant Dis. Reptr*, xxxi, 7, pp. 270–271, 1947. [Mimeographed.]

In southern Alabama cultivated blue lupins (*Lupinus angustifolius*) have been severely attacked by anthracnose (*Colletotrichum* sp.) [*R.A.M.*, xxii, p. 299]. Plants approaching maturity suffered the greatest damage; some fields showed as much as 100 per cent. infection and 90 per cent. of the seed was destroyed. Developing seed pods were most susceptible, but all aerial portions of the plants were attacked. The first symptoms on the pods were small, more or less circular, sunken, black spots, which enlarged rapidly and coalesced, covering the pods with pinkish or salmon acervuli, typical of bean anthracnose [*C. lindemuthianum*]. Seeds within diseased pods were often infected and shrivelled. The hyaline, non-

septate, usually straight spores, with rounded ends, were approximately 6 by 17·5 μ. Brown, unbranched setae about 70 μ long were fairly numerous.

JACKOBS (J. A.). **Factors affecting seed rotting caused by Pythium spp. in Sweet-clover with preliminary tests in Alfalfa and Red Clover.**—*J. Amer. Soc. Agron.*, xxxix, 8, pp. 702–718, 1 diag., 2 graphs, 1947.

The percentage of viable, scarified seeds emerging as seedlings varied among seed lots of sweet clover (*Melilotus alba* and *M. officinalis*) planted in the greenhouse and field at the Wisconsin Agricultural Experiment Station in 1944 and 1945. Lucerne and red clover were included in some of the tests. The rate of emergence was not influenced by soil temperatures within the range of 7° to 22° C. or by the position of the seeds in the flat. Isolates from rotted sweet clover seed included *Pythium debaryanum*, *P. ultimum* (both of which were proved to be pathogenic), possibly other *P.* spp., and species of *Rhizoctonia*, *Fusarium*, and *Mucor*. After the seeds had been planted for 72 hours in *Pythium*-infested soil they could be placed in two classes, in one of which rotting took place before the hypocotyl began to elongate, while in the other it had elongated to at least ½ cm. The lack of gradations between the two groups suggests that seed-rotting is independent of subsequent invasion of the hypocotyl as it occurs in damping-off. Further evidence in support of this view is afforded by the absence of association between the percentages of emergence and of seedlings showing post-emergence damping-off.

Viable immature seeds are more likely to decay than genetically comparable mature ones. A rupture of the seed coat near the hilum is less likely to favour fungal contamination than cracks in other places.

Inherent differences were observed among the plants in respect of the incidence of seed decay in their progenies. They are probably attributable to the mature plant characters influencing seed development rather than to genetic factors for resistance or susceptibility to *P.* spp. in the germinating seeds.

BLAIR (I. D.). **Ryegrass blind seed disease.**—*Agric. Bull. Canterbury Coll., N.Z.*, 210, 4 pp., 2 figs., 1947.

This bulletin gives a brief general account of perennial rye grass (*Lolium perenne*) blind seed disease caused by *Phialea temulenta* [*R.A.M.*, xxvi, p. 231]. The life-cycle of infection, procedure of seed examination, and control measures (resistant strains, crop management, and seed treatment) are described.

An increase of the disease among the now dominant, susceptible true perennials has occurred. Hundreds of rye grass samples from South Island districts have been examined at Lincoln College for pre-harvest infection. During 1944–5 the number of samples showing 0 to 10, 10 to 20, 20 to 30, 30 to 50, 50 to 70, and 70 to 100 per cent. infection were 3, 13, 15, 32, 15, and 22, respectively, the corresponding numbers for 1945–6 in the same categories being 35, 20, 15, 10, 10, and 10, respectively.

The control measures recommended include the planting of rye grass seed crops at some distance from old fields and surrounding them with arable crops, seed storage for two years, and hot-water seed treatment [ibid., xxiii, p. 228].

MILLS (W. D.). **Effects of sprays of lime sulphur and of elemental sulphur on Apple in relation to yield.**—*Mem. Cornell agric. Exp. Sta.* 273, 38 pp., 4 graphs, 1947.

The author summarizes the results of other workers on the effects of sulphur sprays on the growth and yield of apple trees. From these and his own results he concludes that the occurrence of leaf scorch is an accepted fact; its possible subsequent effects on the yield, size, and quality of the fruit are discussed. The increase of the midsummer fruit drop [*R.A.M.*, xx, p. 104] caused by lime-sulphur is far less common in most apple-growing areas than is leaf scorch. Under some con-

ditions this fruit drop tends to increase size by early thinning, whereas size is often reduced by severe foliage injury. The growth rate of young leaves is temporarily retarded by sulphur applications, even by elemental sulphurs, while with lime-sulphur the retardation is much greater. Pre-harvest drop [ibid., xxi, 529] of McIntosh apples may be increased by lime-sulphur in summer sprays. Increase in winter injury to the lower limbs resulted from severe leaf injury by lime-sulphur the previous summer.

Observations are recorded of the effects of several fungicidal programmes over a five-year period from 1933 to 1937 on an orchard of vigorous McIntosh apple trees, individual tree yields of which were available for the three previous years (1930–2) when they received a uniform lime-sulphur schedule. Under this schedule the three-year average yield was taken to indicate the individual yielding capacity of the trees and during the following years the effects of the various fungicides were expressed as deviations in yield under a given treatment from this three-year average of the same tree. Any possible differences due to tree size were avoided by using these deviations expressed in bushels per tree. In the first, fourth, and fifth years trees given flotation sulphur used throughout the season showed a significant increase in yield over those receiving lime-sulphur and also (in the first and fifth years) over those receiving the latter for the calyx spray followed by flotation sulphur or dry-mix sulphur lime. In average yield for the five-year period, flotation sulphur throughout the season gave a significant increase of 135 bushels per acre per year over trees receiving lime-sulphur for all sprays.

Commercial scab [*Venturia inaequalis*] control was obtained with all four schedules used, the increased yield of scab-free fruit obtained by using elemental sulphur sprays instead of lime-sulphur being approximately the same as the increase in total yield. Control of scald and russet were equally effective except in 1936.

ENGLISH (H.). **Powdery mildew on Cherry fruit in Washington.**—*Phytopathology*, xxxvii, 6, pp. 421–424, 1 fig., 1947.

In the summer of 1944 *Podosphaera oxyacanthae* was found infecting sweet cherries harvested from orchards near Wenatchee, Washington, this being apparently the first record of the pathogen on the fruits in the United States, though it has long been known to attack the leaves and shoots. The invaded areas are circular, or more often irregular, due to the coalescence of two or more infections. A thin white mantle of hyphae, radiating from the centre of young lesions, covers the diseased portions and robs them of their lustre. The injured areas become somewhat sunken and the fruits definitely mis-shapen. The older lesions are reddish-brown and the texture of the skin is abnormally tough. Prior to a heavy thunder shower on the evening of 19th July, followed by $1\frac{1}{2}$ days of hot, humid weather, no powdery mildew had been observed on the fruits, but on 21st heavy infection was noted in some of the orchards and on fruit delivered at the packing-house.

The trees in the most severely affected orchard were rather closely planted. The succulent shoots and leaves in the interior of trees with heavy fruit infection invariably sustained extensive damage. The presence of ripe perithecia on the leaves pointed to a fairly early date for the onset of shoot infection, probably during the alternating hot and showery periods about mid-June and the beginning of July. The development of *P. oxyacanthae* on the cherries may also have been influenced by the occurrence of the fungus on neighbouring chokecherries (*Prunus demissa*) [*P. virginiana*]. In the most severely infected orchard, the Bing variety suffered much heavier damage than Lambert or Napoleon. Black Tartarians were reported by fruit inspectors to show the worst damage in the packing-houses.

In storage tests at 40° and 65° F. at a relative humidity of about 85 per cent. no evidence was obtained of any increase in size of the mildew lesions, nor were

new infections observed on any of the fruits apparently sound when stored. At 40° and 65°, slightly more decay developed in mildewed than in sound fruit, but as it amounted to less than 4 per cent. even in the most severely affected sample, susceptibility to storage rots does not appear to be materially increased.

During the dry summer of 1945 the same orchards were scarcely affected by mildew.

NOBLE (M[ARY]) & GRAY (E[LIZABETH] G.). **Two interesting fungi.**—*Gdnrs' Chron.*, Ser. 3, cxxii, 3166, p. 92, 3 figs., 1947.

The first record in the British Isles of *Puccinia ribis* on red currants was reported by Plowright (*Gdnrs' Chron.*, xvi, p. 135, 1894) from specimens from Dallas, Morayshire. In the autumn of 1946, a specimen of this fungus was received from Mr. Murray of the North of Scotland College of Agriculture, who collected it at Coulmony, near Dava, Morayshire. The garden in which it was found contained some very old, severely infected bushes, from which the disease spread to young bushes near by. In June, 1947, the rust reappeared on the old bushes. In the early stage of infection the leaves show dark green spots, the centres of which become dark purple-black as the spores develop, and a yellow halo appears. The very early appearance of the disease bears out the view that the mycelium of the fungus overwinters in the buds. The bushes at Coulmony are so old that they may be contemporary with the original ones which no longer remain at Dallas. The two instances described in this paper are the only known British records.

Hapalosphaeria deformans [*R.A.M.*, xxii, p. 318] was found on blackberries for the first time in the British Isles at Aberlady, East Lothian, in 1922 and was described by Dr. M. Wilson (*Trans. Brit. mycol. Soc.*, vii, p. 84, 1922). The fungus was found again in 1947 in East Lothian, Midlothian, Perthshire, and the suburbs of Edinburgh, and the authors conclude that the fungus is common on wild blackberries in these districts, though it has not been observed yet on cultivated plants or other species of *Rubus*.

DEMAREE (J. B.). **A proliferating gall on Blueberry plants caused by an Actinomyces.**—Abs. in *Phytopathology*, xxxvii, 6, p. 438, 1947.

The fungus responsible for tumefactions, often accompanied by bud proliferation, at or near the primary node of blueberry (*Vaccinium*) plants [? in Maryland] has been tentatively identified as an *Actinomyces*. The swellings, which commonly attain enormous dimensions in relation to the infected stem, give rise to numerous, mostly abortive buds; a few, however, may differentiate into short, fleshy shoots with abnormal foliage, or several buds may develop into spindly shoots with small leaves, culminating in a growth of the witches' broom type. Young plants readily contracted infection when fragments of agar containing hyphae and spores were applied to wounded tissues near the primary node. The pathogen was reisolated from the plants thus infected and served as inoculum in its turn. The original isolations came from spontaneous galls on young blueberries cultivated in soil composed partly of leaf mould from a forest floor where huckleberries (*Gaylussacia baccata*) grew, many of them affected by an undetermined witches' broom. Among several different lots of seedling blueberries totalling over 1,700, the incidence of natural infection per lot ranged from 8 to 70 (average 26) per cent.

CASS SMITH (W. P.) & STEWART (Miss [R.]). **Leaf spot disease of Black Mulberry.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxiv, 1, pp. 69–74, 3 figs., 1947.

The fungal leaf spot disease of black mulberry (*Septogloeum mori*) [*R.A.M.*, xvi, p. 785], first recorded in Western Australia in 1943, spread so rapidly during the 1945–6 and 1946–7 seasons that it now affects practically all areas of the State where mulberries are grown. Although they are of little economic importance

compared with other fruits, mulberries are very easily grown and are therefore valuable as a source of fresh fruit. The fungus appears to be confined to the leaves upon which dark spots, 1 to 2 mm. in diameter, surrounded by light green or yellow tissue, appear early in the growing season. These spots enlarge, the centre turning white with numerous very small, black pustules developing on the surface of the lesions. In humid weather the pustules become raised and pinkish. The leaf spots may reach 10 mm. or more in diameter, with dark brown margins and whitish centres. Browning of the veins occurs near the necrotic area. The coloured areas round the spots may coalesce and eventually cause severe defoliation. If the tree is thus weakened early in the season premature fruit drop occurs.

The black pustules or acervuli consist of a flat stroma from which arise the conidiophores and conidia which are elongate, thin-walled, and colourless with two to three septa. The conidia become exposed as a pinkish, upraised mass and are disseminated by wind and rain from leaf to leaf. In autumn when the vigour of the leaves declines, dark, thick-walled, 1- to 9-septate spores are formed. In cool and wet conditions the conidia germinate and reinfect the leaves through the stomata on the lower surface, causing new leaf spots from which fresh spores arise. After dry periods in summer the disease becomes active again with the arrival of the rains. The thick-walled spores in infected leaves held over winter and exposed to natural climatic conditions were more than 80 per cent. viable in spring as determined by pathogenicity tests.

So far, Bordeaux mixture and lime-sulphur applied during the growing season have proved capable of controlling an epidemic. The following four measures are recommended for controlling the disease: (*a*) destroy all fallen leaves in autumn, (*b*) as the buds begin to swell in spring spray the trees with lime-sulphur at 1–15 or Bordeaux at 6–4–40, followed a fortnight later by (*c*) a second spray at 1–50 or 3–4–40, respectively, (*d*) if dry weather follows the first spray the second may be unnecessary, but in wet weather a third with lime-sulphur at 1–100 or Bordeaux at 2–4–40 should be applied after the fruit is set.

BITANCOURT (A. A.) & JENKINS (ANNA E.). **A verrugose da Mangueira.** [Mango scab.]—*Arq. Inst. biol., S. Paulo*, xvii, pp. 205–228, 3 pl., 1946. [English summary.]

This is an expanded account of the authors' studies on specimens of mango scab from Cuba, Florida, Puerto Rico, and the Canal Zone [*R.A.M.*, xxii, p. 216]. The ascomata of the causal organism, *Elsinoe mangiferae* n. sp., are pulvinate, intra-epidermal, 80 to 160 by 30 to 48 μ, with a pseudoparenchymatous, hyaline matrix. The scattered, globose asci are 10 to 15 μ in diameter and contain one to eight hyaline, triseptate ascospores, 10 to 13 by 4 to 6 μ. The perfect state was collected only in Cuba. The conidiophores of *Sphaceloma mangiferae* are erect, slightly sinuous, 12 to 35 by 2·5 to 3·5 μ, and the elongated, brownish, continuous or uniseptate, catenulate conidia measure 6 to 29 by 2 to 4 μ. This probably represents the imperfect state of *E. mangiferae*, but definite evidence of a genetic connexion is not yet forthcoming.

Material of a similar disease collected in São Paulo, Brazil [loc. cit.], yielded perithecia measuring 38 to 55 by 15 μ and globose asci, 12 μ in diameter, containing up to eight hyaline, triseptate, straight or slightly curved ascospores, 10 to 12 by 3 to 4 μ. No fructifications of the imperfect state were observed. The Brazilian fungus developed most profusely at 21° C. and the Cuban at 27°, the latter also making appreciable growth at 35°, whereas 31° was the maximum for the former. Inoculation experiments on young mango foliage were successful with the Cuban but not with Brazilian isolate. It is concluded from those studies that the two pathogens are distinct, and that the Brazilian disease should be classed as an anthracnose rather than as a scab [ibid., xii, p. 596].

Das Gupta (S. N.) & Rai (J. N.). **Wilt disease of Guava (Psidium guajava L.).**—*Curr. Sci.*, xvi, 8, pp. 256–258, 2 graphs, 1947.

In order to investigate a destructive wilt of guavas occurring at Lucknow and in other districts of the United Provinces, trees of the Government Horticultural Garden were kept under careful observation during the years 1945 and 1946. The highest rate of wilting occurred during the rainy season, the disease starting in August (four trees attacked) and increasing sharply in September (15) and October (10) when the most deaths occurred. In November there was a marked decrease in the number of infected trees (six to seven) and with the advancing winter the disease came almost to a standstill. The symptoms are a yellowing and drying of the leaves of terminal branches, the complete wilting of the tree taking 10 to 15 days. Some of the finer roots showed black streaks which became more prominent on removing the bark, while others were uniformly black. Isolations from the root system and the lower part of the diseased trees yielded a *Fusarium* sp. Inoculation tests were made with potted plants one month, three months, one year, and three years old, to the soil of which the *Fusarium* culture was added. The percentages of wilted plants of the different ages were 86·3, 100, 83, and 80, respectively; no wilting occurred in the controls. The fungus was reisolated from the roots of the wilted plants. Grown in Richards's solution it produces some toxic substance which causes wilt in the guavas. Seedlings transferred to these solutions die readily. In a filtered 20-day-old culture solution the first wilt symptom in one-year-old seedlings was observed after three hours, and within 10 to 12 the plants died. Further studies of the mechanism and physiology of wilt are in progress and a detailed paper is expected to be published shortly.

Seín (F.) & Adsuar (J.). **Transmission of the bunchy top disease of Papaya (Carica papaya L.) by the leafhopper Empoasca papayae Oman.**—*Science*, cvi, 2745, p. 130, 1947.

The authors report further successful transmissions of papaw bunchy top disease [*R.A.M.*, xxvi, p. 458] by leafhoppers now definitely identified as *Empoasca papayae* [ibid., xxv, p. 305] and confirmed by P. W. Oman. Out of 30 healthy plants whose upper parts were enclosed in cellophane casings, and on each of which five to ten male insects collected from diseased plants were released, nine developed bunchy top symptoms in about 90 days. Thirty control plants excluded from leafhoppers remained healthy.

Horsfall (J. O.). **Naming of synthetic fungicides.**—*Plant Dis. Reptr*, xxxi, 7, p. 268, 1947. [Mimeographed.]

Dr. D. Powell of the University of Illinois has agreed to set up a sub-committee of the general Committee on Fungicides of the American Phytopathological Society in order to study the problem of common names of synthetic chemicals and fungicides [*R.A.M.*, xxvi, p. 459]. The author suggests that the Society should delegate to its Fungicide Committee, working in collaboration with the entomologists, the authority to choose common names and recommend their adoption.

Khristov (A.). Фитопатология. [Phytopathology.]—608 pp., 73 figs., Sofia, Published for the University Students' Aid Fund in Bulgaria, No. 128, 1947. [Mimeographed.]

This book contains abbreviated records of lectures on plant diseases given at the Sofia State University during 1946–7, and is divided into two sections, I [pp. 16–119] non-infectious diseases caused by chemical factors (soil deficiency and excess nutrients) and weather conditions, II [pp. 120–607] infectious diseases (virus

diseases [pp. 120–187], bacterial [pp. 188–245], fungal [pp. 246–586], and those due to higher plants [pp. 587–601]).

Presley (J. T.). **A host index of Mississippi plant diseases.**—*Plant Dis. Reptr, Suppl.* 169, pp. 55–168, 1947. [Mimeographed.]

This first contribution towards a host index of plant diseases in Mississippi contains all the available information on their occurrence and distribution in the State. It consists of three sections, each arranged alphabetically: a list of hosts (under the Latin names), with all the pathogens known to occur on each, an index of pathogens, each accompanied by the Latin names of the hosts on which it has been recorded, and an index of the common names of the hosts.

Snyder (W. C.) & Hansen (H. N.). **Advantages of natural media and environments in the culture of fungi.**—*Phytopathology*, xxxvii, 6, pp. 420–421, 1947.

One of the natural media found effective both for the sporulation and isolation of certain fungi is a fumigated chopped pea straw in water agar [*R.A.M.*, xxvi, p. 461]. Cultured on this substratum the hyphae of *Mycosphaerella pinodes* and *Ascochyta pinodella* develop a profusion of typical dark chlamydospores around and on the fragments of straw, while pycnidia may be found on the agar surface. Plates of pea-straw agar may be taken into the field where surveys are to be made and even the underground parts of the plants may be placed directly on the medium after removal of the adhering soil. Specific identification of *A. pinodella* and *M. pinodes* can usually be effected in a week by this method. *Verticillium albo-atrum* also grows readily on pea-straw agar, the hyphae producing an abundance of microsclerotia on and around the fragments of straw, while typical conidiophores and conidia develop on the surface of the agar. No preliminary sterilization of the infected tissues is required, nor do laboratory contaminants appreciably interfere with the recovery of the fungus. Other fungi easily isolated from gross cultures on pea-straw agar include *Phytophthora*, *Pythium*, and *Rhizoctonia* spp., *Alternaria solani*, and a species of *Gloeosporium*, of which the two last-named sporulated abundantly. Perithecia of *M. pinodes* are produced in large numbers on the straw in a wheat straw plus agar medium.

Other examples are adduced to illustrate the influence of natural surroundings on the development of fungi. Thus, *Centrospora* [*Ansatospora*] *acerina* [ibid., xxiv, p. 305] sporulates copiously on agar media outside but not inside a north window, as also do the imperfect states of *Botryosphaeria ribis* and *M. brassicicola* [cf. ibid., xxvi, p. 152].

Cooper (P. S.). **Plant injections for diagnostic and curative purposes.**—*E. Afr. agric. J.*, xiii, 1, pp. 37–53, 4 diags., 1947.

A description is given of the use of a hypodermic syringe for plant injections in the diagnosis of mineral deficiencies [*R.A.M.*, xxiv, p. 334; xxvi, p. 342], a technique requiring only patience and experience with relatively little technical skill in order to obtain rapid and accurate results. The advantages and disadvantages of using the syringe are discussed, the two most useful types are described, and a list is given of the additional equipment required. The veinal, leaf tissues, and stem injection methods are described and their application to individual plants is discussed, the type and strength of the chemical solutions used are given, and the effect of chemical and mechanical damage is assessed. The length of time which elapses between injection and the appearance of symptoms is shown to vary with the type and age of plant, the element being injected, and the atmospheric temperature. The symptoms attributed to deficiencies of some of the major and minor elements are briefly outlined, and a short note is given regarding tablet injection methods [ibid., xxiv, p. 334].

The results of tests in England [? and Uganda] show that the injection of nitrogen (ammonium, calcium, or potassium nitrate) into plants suffering from nitrogen deficiency by all three methods resulted in the renewal of the normal green colour of the injected leaf in a few hours. When deficient field cabbages were inoculated it was possible to confirm a nitrogen deficiency after 24 hours and complete recovery resulted in 36. Injections of dicalcium phosphate resulted in renewal of the green colour after three to six days. Barley plants suffering from severe phosphate deficiency did not recover until four days after injection. Potash deficiency has been successfully diagnosed and the normal leaf colour renewed in three to five days in a wide variety of plants in the early stages of deficiency. Injections with calcium nitrate took about the same time, coffee seedlings recovering completely ten days after injection. Injections with magnesium sulphate produced the return of normal colour within six to seven days. Slightly affected greenhouse tomato plants recovered in five days [cf. ibid., xxvi, p. 185]. Injections of acid ferrous (iron) sulphate by the leaf veinal and stem methods into deficient greenhouse tomato plants gave renewed colour in 36 hours. Manganese sulphate injections renewed the healthy colour in citrus leaves in eight to nine days and corrected grey speck [manganese deficiency] of oats if injected while the streaks were still in the grey state. Leaves of the groundnut injected with zinc sulphate became noticeably greener after five days, this being the first recorded case of zinc being essential to groundnuts under field conditions. The leaves of zinc-deficient maize plants recovered their greenness about three days after injection. Injections with boric acid into young boron-deficient sugar beet caused recovery of the distorted crown leaves and the production of new healthy growth. Cassava cuttings infected with cassava mosaic virus [ibid., xxvi, p. 281] were injected at intervals of 10 days with a 5 per cent. solution of 8-hydroxy-quinoline potassium sulphate, and all the leaves recovered eight days after the fourth injection.

GEORG (LUCILLE K.). **A simple and rapid method for obtaining monospore cultures of fungi.**—*Mycologia*, xxxix, 3, pp. 368–371, 1 fig., 1 diag., 1947.

In order to isolate single spores [*R.A.M.*, xxv, p. 406] 2 to 3 μ or larger, a small conical glass tip can be made from a length of glass tubing; the larger end should fit round the lens of the low-power objective (6 to 7 mm.) and the smaller should approximate the microscopic field as seen through the lens (1·5 to 1·8 mm.). The tube is heated to redness and drawn out to the required shape. A thin ring of plasticine is fitted round the lens of the low-power objective and to this the sterile conical tip is fixed. The spore is centred in the microscopic field, and the objective lowered so that the small end of the tip cuts a disk of agar containing the spore. This disk is then removed by a sterilized needle.

CICCARONE (A.). **Verde iodio ed eritrosina nella differenziazione di parassiti fungini in tessuti legnosi.** [Iodine green and erythrosin for the differentiation of fungal parasites in woody tissues.]—*Nuovo G. bot. ital.*, N.S., liii, 1–2, p. 358, 1946.

In a study of *Monochaetia unicornis* in relation to a woody canker of *Cupressus macrocarpa* [*R.A.M.*, xxv, p. 86], in which difficulty had been experienced in differentiating the mycelium from the disintegrated gummy tissues of the host, good results were obtained from the following treatment, the host tissues turning green and the parasite violaceous-red. The material was placed in a 1 per cent. aqueous solution of iodine green for 5 to 15 minutes, washed in water (this may be omitted), placed in 95 per cent. alcohol followed by absolute alcohol, then, for 8 to 15 minutes or more in erythrosin in 1 per cent. clove oil, cleared in clove oil, and then taken through absolute alcohol and xylol to balsam. The same method also proved satisfactory with *Pestalozzia* [*Pestalotia*] *funerea*, also on *C. macrocarpa*.

KAVANAGH (F.). **Estimation of antibacterial substances by serial dilution methods.**—*Bull. Torrey bot. Cl.*, lxxiv, 4, pp. 303–320, 1947.

This study deals with several modifications of serial dilution methods suitable for quantitative measurement of concentrations of anti-bacterial substances [*R.A.M.*, xxvi, p. 206]. Descriptions are given of the selection of bacteria and media, the identification of the substances by their anti-bacterial activity, and the manipulative details and results of three modifications of the geometric-series dilution test and one of the arithmetic-series. The errors occurring in the dilution tests are also discussed.

ROBBINS (W. J.), KAVANAGH (F.), & HERVEY (ANNETTE). **Antibiotic substances from Basidiomycetes. I. Pleurotus griseus.**—*Proc. nat. Acad. Sci., Wash.*, xxxiii, 6, pp. 171–176, 1947.

During laboratory studies on Basidiomycetes producing substances that inhibited the growth of *Staphylococcus aureus* [*R.A.M.*, xxvi, p. 258], *Pleurotus griseus* seemed particularly worthy of further investigation. The results showed that *P. griseus* produces a substance differing from all other antibiotic substances that have been prepared in pure form. The best medium for *P. griseus* was found to be beech shavings in modified Czapek-Dox solution to which dextrose and maize steep solids were added. The method of isolation and properties of the antibiotic substance named pleurotin are described. It is active only against Gram-positive bacteria. The instability and low solubility of pleurotin in aqueous solution indicate that it is unlikely to have any therapeutic value.

ROBBINS (W. J.), KAVANAGH (F.), & HERVEY (ANNETTE). **Antibiotics from Basidiomycetes. II. Polyporus biformis.**—*Proc. nat. Acad. Sci., Wash.*, xxxiii, 6, pp. 176–182, 1947.

The further investigation of *Polyporus biformis* [*R.A.M.*, xxvi, p. 258] showed that it produces two antibiotic substances in culture liquids, to which the names biformin and biforminic acid have been given. These substances inhibit a number of Gram-negative, Gram-positive, and acid-fast bacteria.

RUDERT (F. J.), KENNER (B. A.), & FOTER (M. J.). **The assay of antibiotic mixtures.**—*J. Bact.*, liii, 1, pp. 57–60, 1947.

These studies were undertaken to devise plate assays suitable for the determination of single components in the following mixtures: penicillin-streptomycin, gliotoxin-streptomycin, and gliotoxin-penicillin. The following procedures were used to separate the components. Treatment with 0·01 *M* potassium periodate destroyed streptomycin but the gliotoxin remained unaffected. Extraction by chloroform removed the gliotoxin, but streptomycin and penicillin were retained in the water layer. Penicillin was inactivated by a 10 per cent. volume of penicillinase solution containing 200 penicillinase units per ml. Penicillin could be assayed in the presence of 10 parts of streptomycin by using *Staphylococcus aureus* FDA 209P. Various known inactivators of streptomycin were used in an effort to find a selective agent but all destroyed penicillin to a certain degree.

The assays were made on nutrient agar by the filter paper disk method and the methods are adaptable to mixtures containing widely different proportions of antibiotics, with the exception of penicillin in the presence of streptomycin where the assayable proportions depend on the sensitivity of the *S. aureus* strain used.

Penicillin: its properties, uses, and preparations.—viii+199 pp., 9 figs., 5 diags., 2 graphs, London. The Pharmaceutical Press, 17 Bloomsbury Square, W.C. 1, 1946. 10*s*. 6*d*.

The first chapter of this handbook, published by direction of the Council of the Pharmaceutical Society of Great Britain, is an historical summary of the discovery

and development of pencillin. The remaining chapters deal with (II) commercial manufacture, (III) chemistry and chemical properties, (IV) stability, (V) standard, unit, and methods of assay, (VI) pharmacology, (VII) clinical use, (VIII) pharmacy and pharmaceutical preparations, and (IX) legal considerations. A bibliography of 331 titles is appended.

WINSTEN (W. A.) & SPARK (A. H.). **Penicillin types produced by P. chrysogenum Q-176.**—*Science*, cvi, 2748, pp. 192–193, 2 figs., 1947.

Tests with *P[enicillium] chrysogenum* Q-176 grown on maize steep liquor-lactose medium showed that it can produce at least eight penicillins [*R.A.M.*, xxvi, p. 164]. These include G (benzylpenicillin), F (Δ^2-pentenylpenicillin), what is probably dihydro-F (*n*-amylpenicillin), K (*n*-heptylpenicillin), and X (*p*-hydroxybenzylpenicillin). The new types S-1, S-2, and S-3, which were produced in small quantities, have not as yet been specified chemically. A modification of Goodall and Levi's method (*Nature, Lond.*, clviii, pp. 675–676, 1946) was used in determining the types of penicillin present.

VERONA (O.). **Influenza di liquidi colturali fungini sullo sviluppo dei microbi del suolo.** [The influence of fungal cultural liquids on the development of soil micro-organisms.]—*Ann. Fac. agr. Pisa*, N.S., vii, pp. 147–156, 1946.

To ascertain the effect produced by filtrates from the cultures of various fungi upon soil micro-organisms, an experiment was carried out in which filtrates from cultures of *Aspergillus* sp., *Chaetomium globosum*, *C.* sp., *Stachybotrys atra* [*R.A.M.*, xviii, p. 696; xxiv, p. 389], *Stemphylium botryosum* [*Pleospora herbarum*], *Alternaria tenuis*, *Fusarium* sp., *Rhizopus nigricans* [*R. stolonifer*], and *Mucor mucedo* were mixed in various proportions with saccharose-bean agar and added to Petri dishes containing 0·1 c.c. of a mixture of soil in water (1 in 1,000). After three days at 24° C. it was found that the agar without addition of culture filtrates showed 496 colonies of micro-organisms. The agar with the *Aspergillus* filtrate (1, 2·5, and 5 per cent. additions) showed, respectively (average of three determinations), 28, 16, and 4 colonies. The corresponding figures for *Chaetomium* sp. were 9, 4, and no result, for *C. globosum* 190, 75, and 24; and similar reductions were obtained with all the filtrates except *Fusarium* sp. and *Stachybotrys atra*. When the experiment was repeated using a different method of culturing the fungi, the results were confirmed. A third experiment was then carried out, using retorts each with 250 c.c. nutrient broth, to some of which 5 per cent. of culture filtrate of either *Aspergillus* sp. or *Chaetomium* sp. was added. All the retorts were then sown with 0·5 c.c. of the 1:1,000 soil–water mixture and kept at 24° for five days. The numbers of micro-organisms present in 1 c.c. of the culture liquid after one day were 270,000 for the control, 12,000 for *Aspergillus* sp., and 65,000 for *Chaetomium* sp., the corresponding figures for three days being 7,410,000, 93,400, and 70,300, and for five days over 7,410,000, 182,620, and 398,500 (average of three determinations in each case). In the fourth experiment the culture filtrates from *Aspergillus* sp. and *Chaetomium* sp. were used (*a*) after boiling for ten minutes and (*b*) after mixing with soil. After three days at 24° the controls showed 740 colonies. The boiled *Aspergillus* filtrate (25 and 5 per cent.) gave, respectively, 110 and 97, and that mixed with soil 520 and 643; the boiled *Chaetomium* filtrate gave 270 and 29 and that mixed with soil 881 and 540. From this it is concluded that the culture extracts were thermostable with respect to their antibiotic activity, but that the substances possessing the antibiotic activity were largely retained by the soil. Evidence was obtained that the filtrates of *Aspergillus* sp. and *Chaetomium* sp. slowly exercised a dissociative effect on colonies of *Bacterium coli* and *Bact. tumefaciens*.

Scofield (F.). **Methods of mildew tests.**—*Paint Indust. Mag.*, lxi, pp. 176–177, 1946. [Abs. in *Brit. Chem. Abstr.*, B II, December, p. 467, 1946.]

In Florida the best conditions for exterior field tests for the resistance of paints to mildew [*R.A.M.*, xxvi, p. 503] are provided by a site near a grove of trees; vertical exposure to prevent confusion with dirt collection; north exposure; the spring months; and panels painted and dried on the exposed site. Since the principal infection occurs before the film hardens, the tests need only run sufficiently long for the spores to germinate, i.e., three to four weeks. Brief observations are made on the testing of interior paints.

Nagy (R.). **Ultraviolet lamps to control fungi.**—*Food Indust.*, xix, 7, pp. 102–103, 5 figs., 1947.

Pure cultures of a number of food moulds were exposed to measured amounts of ultra-violet radiation [*R.A.M.*, xxiii, p. 266 and next abstract] (Westinghouse Electric Corporation) and allowed to incubate for 48 hours with the following results, expressed in the number of 'clicks' of energy (one 'click' = 220 micro-watt seconds per sq. cm.) requisite for the destruction of the organisms: *Penicillium roquefortii* 120, *P. expansum* 100, *P. digitatum* 400, *Aspergillus niger* 1,500, *A. flavus* 450, *A. glaucus* 400, *Rhizopus nigricans* [*R. stolonifer*] 1,000, *Mucor racemosus* A and B 160, and *Oospora lactis* 50. It will be noted that pigment acts as a protective mechanism; the darker the colour of the spores, the more radiation is necessary to kill them.

Ohart (T. C.). **Germicidal lamps improve food plant sanitation.**—*Food Packer*, xxviii, 9, pp. 30–32, 4 figs., 1947.

Directions are given for the installation of G(eneral)-E(lectric) germicidal lamps, emitting ultra-violet wave-lengths in the region of 2,537 Å, in food plants for the control of bacteria and moulds [see preceding abstract], with special reference to the meat industry.

Agarwal (P. N.), Singh (K.), King (P. S.), & Peterson (W. H.). **Yields and vitamin content of food yeasts grown on different kinds of molasses.**—*Arch. Biochem., N.Y.*, xiv, 1–2, pp. 105–115, 1947.

At the Wisconsin Agricultural Experiment Station four food yeasts, namely, *Saccharomyces cerevisiae*, *Torula* [*Torulopsis*] *utilis* [*R.A.M.*, xxvi, p. 207], *Candida arborea*, and *Oidium* [*Oospora*] *lactis*, were grown on four kinds of molasses (Lansing, Mason City, and Ovid beets, and Hawaiian cane). Yields ranging from 44 to 65 per cent. based on the sugar supplied were obtained. Some 90 per cent. of the sugar was fermented. The reinforcement of the medium with nutrients, e.g., phosphate, urea, and maize steep liquor, was essential for the production of maximum yields. The protein contents of the yeasts ranged from 31 to 69 per cent. and their thiamin, riboflavin, niacin, and folic acid values from 20 to 40, 40 to 69, 192 to 600, and 6 to 22 γ per gm. dry yeast, respectively. As sources of protein and B vitamins *S. cerevisiae*, *T. utilis*, and *C. arborea* are about equally effective, while *O. lactis* is distinctly inferior.

Johnson (J.). **Water-congestion and fungus parasitism.**—*Phytopathology*, xxxvii, 6, pp. 403–417, 2 figs., 1947.

Water congestion may be induced experimentally in many plant species under favourable moist-chamber conditions [*R.A.M.*, xxv, p. 237]. Greenhouse-grown seedlings should be exposed to an outdoor environment in a sandy or sandy-loam soil low in potash for five to ten days before transference to the moist chamber. At the Wisconsin Agricultural Experiment Station marked intervarietal differences

in the rate and extent of visible water congestion were observed, sometimes even involving individual plants of the same variety.

Water-congested plants of a given variety were shown by inoculation experiments to be more susceptible to representative fungal pathogens, especially when grown in the open, than non-congested, e.g., Bountiful, Black Wax, and Great Northern beans (*Phaseolus vulgaris*) to anthracnose (*Colletotrichum lindemuthianum*), Marquis wheat to stem [black] rust (*Puccinia graminis*), States Pride and Vicland oats to leaf [crown] rust (*P. coronata*), Golden Bantam and Golden Glow maize to rust (*P. sorghi*) [*P. maydis*], and Marglobe tomato to late blight (*Phytophthora infestans*). No visible signs of water congestion appeared in potato and sunflower in these studies, but both indoor- and outdoor-grown plants of the former host developed late blight (*P. infestans*) and those of the latter rust (*Puccinia helianthi*) in the inoculation tests, presumably associated with a macroscopically imperceptible degree of congestion. Susceptible varieties developed water congestion more easily than resistant varieties.

Drechsler (C.). **Germination of oospores of Pythium butleri and Pythium tardicrescens.**—Abs. in *Phytopathology*, xxxvii, 6, pp. 438–439, 1947.

Transferred to a shallow layer of distilled water, oospores of *Pythium butleri* [*P. aphanidermatum*] from 60-day-old maize meal agar cultures germinated freely by the production of zoospores. The process was commonly preceded by the resorption of the thick inner wall layer, while the protoplasm assumes an appearance closely resembling that of the sporangium of *P. debaryanum*. On discharge into a vesicle at the apex of a simple or occasionally branched evacuation tube, averaging 40 to 225 by 2·5 to 5 μ, the contents are converted into about ten motile zoospores. A similar mode of germination was observed in the oospores from a 112-day-old culture of *P. tardicrescens* [*R.A.M.*, xxiii, p. 441], isolated from a blackened *Bidens* root at Arlington, Virginia, in October, 1943, the tube in this species measuring 60 to 350 by 2 to 3 μ. After discharge the persistent outer oospore wall in both species sometimes encloses a separate sporangial envelope.

Baribeau (B.). **Possibilités d'amélioration, d'organisation et d'extension de la production des Pommes de terre de semence.** [Possibilities of improving, organizing, and extending the production of seed Potatoes.]—Reprinted from *Agriculture*, [? *Quebec*], iv, 1, 19 pp., 7 figs., 1 graph, 1 map, 1947.

After stating that in the northern and north-eastern regions of Quebec potato degeneration due to virus diseases progresses much more slowly than in the warmer south and south-west [*R.A.M.*, xxvi, p. 209], the author describes a study, based on the results given by the tuber-index method [ibid., xxvi, p. 414], of the suitability for seed-potato growing of different areas of the Province. The evidence obtained showed that the spread of potato virus diseases depends on proximity to the sea, isolation, altitude, aspect, climatic conditions, prevalence of insect vectors, and the presence of certain trees and shrubs. Even in areas least favourable to virus diseases it is essential to maintain the usual precautions, and even to renew the seed from time to time.

In the Province as a whole there is a shortage of seed potatoes of good quality. The average yield of culinary potatoes from 1942 to 1946 was only 120 minots per acre [1 minot = 39 l.], though the yield of certified seed potatoes for the same period was 237 minots per acre. The low figure of 120 minots is due to the fact that for 90 per cent. of the total potato area (160,000 acres) the seed used was of variable and often very inferior sanitary quality. The total requirement of seed potatoes for Quebec as a whole probably reaches over 2,000,000 minots. The present (1946) minimum requirement of good-quality seed amounts to over 500,000 minots. To meet this there are (1946) 8,000 to 12,000 minots of Foundation seed, 180,000

minots, at most, of Foundation A seed, and perhaps 100,000 minots of satisfactory Certified seed. It is obvious that every area suitable for seed potato production must be organized so as to produce in 1947 the greatest possible quantity of good seed. The possibilities of new districts can be estimated by the isolated tuber method and the tuber index method.

LITTLEJOHN (L. J. S.). **Experiments with Potatoes in Cyprus.**—*Emp. J. exp. Agric.*, xv, 59, pp. 195–205, 1947.

In this paper there is an illuminating paragraph demonstrating with the aid of tables the seriousness of 'degeneration' in Cyprus and the need for general 'seed' certification [*R.A.M.*, xxv, p. 464] and inspection. During the years 1939 to 1945 the average potato yield was falling owing to the increasing amounts of various virus complexes being distributed through the stocks. When a comparison was made between once-grown tubers and those grown seven or eight times, both lifted in June, 1944, and kept in cold storage, the yields obtained in 1945 were 120 and 37·3 cwt. per acre, respectively. The commonest acute symptom of virus attack is leaf-drop streak [potato virus Y: ibid., i, p. 250 *et passim*], which can be almost fatal, especially to Up-to-Date.

In 1944 a local potato seed certification scheme based on field inspection of the growing crop was started in order to offset the shortage of imported seed. Seed older than 'twice-grown' is not inspected. According to the results of tests of certified seed in 1945, inspection and certification can do much to raise the general level of potato yields. The use of locally certified once-grown seed for the second (autumn) crop and locally certified twice-grown seed for that part of the first crop not planted with imported seed would considerably increase average yields. The use of certified seed is increasing especially in villages where the dormancy is broken by some form of treatment [ibid., xxvi, p. 212].

MILLS (W. R.). **Blight-immune Potato varieties show good qualities in regional trials.**—*Bull. Pa St. Coll.* 480, *Suppl.* 3, pp. 3–4, 3 figs., 1947.

In the 1946 potato-yield trials at the Pennsylvania State College Experiment Station in which no fungicides were applied and no blight [*Phytophthora infestans*: *R.A.M.*, xxvi, p. 506] appeared on the resistant varieties, 34 of the latter exceeded 500 bush. per acre and 17 of these yielded over 600, the highest figure being 806 compared with 250 to 300 bush. from the susceptible varieties. The results show that a good blight-resistant variety may be grown at a considerably lower cost per acre than a good susceptible variety.

CALLBECK (L. C.). **Killing Potato tops with chemicals.**—*Proc. Potato Sect. Ont. Crop Improvement Ass., 1947*, pp. 11–20, 1947.

The perfect chemical potato-top killer should be inexpensive, should kill effectively and rapidly, and should be non-injurious to crop, soil, and workers. With these points in mind several chemicals [*R.A.M.*, xxvi, pp. 78, 463] were tested at the Charlottetown Laboratory during 1946. Of those which most nearly fulfilled the conditions, calcium cyanamide was apparently most effective during warm, humid weather. Sodium arsenite or handy killer, used quite considerably in eastern Canada and the New England States at 1 qt. per 40 gals., is very slow in action when the plants are growing vigorously, the kill being accomplished in three to five days. Handy killer is, therefore, not suitable for virus control work but would be useful in autumn for herbicidal work when the plants are senescent. The main factors contributing to its popularity are its cheapness and simplicity of preparation. Sinox (2 gals. in 100) plus 8 to 10 lb. ammonium sulphate has given satisfactory results, a complete kill taking about three days. Two pints of sinox general [loc. cit.] with 4 gals. oil per 80 gals. spray as emulsifier gave a very rapid and

complete kill after three days. Dowspray 66 improved (dinitro ortho secondary butyl phenol in oil, used at 2 gals. in 100), placed in the market in 1946, and sinox general (2 pts. in 80) plus 2 gals. fuel oil produced the most rapid kills in 1946 and reduced tuber discoloration [see next abstract] after four months' storage to a minimum.

RICHARDSON (J. K.). **Tests with Potato vine killers in Ontario.**—*Proc. Potato Sect. Ont. Crop Improvement Ass., 1947*, pp. 21–23, 1947.

Two preliminary tests were conducted [in 1946], one at Brantford on a field of Chippewa potatoes using three herbicides and another at St. Catherines with eight. At Brantford all three herbicides (sinox general, dow 66, and krenite+ammonium sulphate) [see preceding abstract] caused a rapid kill, the effects becoming apparent a few hours after the application and death ensuing two days later. These same materials produced the same rapid results at St. Catherines, the others being much slower. Tubers left in the ground at Brantford for an extra three weeks had less vascular discoloration if the tops had been killed with dow 66 or sinox general than those killed with krenite+ammonium sulphate. At St. Catherines, although on the contrary the rapid killers produced slightly more injury than the slower ones, none produced more than a slight amount of discoloration. From these tests and information gained from other sources vascular discoloration produced by chemical vine-killers appears similar to injury from severe frost or leaf roll virus infection but does not seem to affect the growing qualities of the tubers, it is reduced by boiling and does not affect the edible qualities of the potatoes, and varieties seem to differ in their susceptibility to the condition. Observations made by various investigators indicate that the age of the plants, rapidity of kill, and the environmental conditions both prior and subsequent to top-killing may have a bearing on the severity of vascular necrosis in the tubers.

WILSON (A. R.), BOYD (A. E. W.), MITCHELL (J. G.), & GREAVES (W. S.). **Potato haulm destruction with special reference to the use of tar acid compounds.**—*Ann. appl. Biol.*, xxxiv, 1, pp. 1–33, 2 graphs, 1947.

In this investigation to find a non-corrosive spray for destroying potato haulms [see preceding abstracts] only those tar acids proving both effective and relatively harmless to the human skin were passed as suitable. At present compounds suitable for commercial production have been obtained only from the vertical-retort and low-temperature processes. High-boiling fractions (250° to 290° C.) usually fulfilled these conditions better than low-boiling fractions (190° to 250°). A tenacious rain-resistant emulsifier consisting of a mixture of gum arabic (1 per cent.) and casein (0·5 per cent.) was developed, yielding a stable concentrate easy to dilute with water of any hardness. Rainfall shortly after application considerably reduced the action of sulphuric acid, but in spite of this and other disadvantages it remains the best all-round herbicide. Sodium chlorate gave a fair leaf-kill but poor stem-kill and is therefore less effective than sulphuric acid, while calcium cyanamide dust was less efficient than sodium chlorate. Tar oil winter wash was effective but is expensive and slow-acting.

The extent of haulm-kill obtained directly influenced the control of blight [*Phytophthora infestans*] in the tubers. The fungus, unless actually wetted by the spray, continues to sporulate freely on the leaves until the tissues are dead. Therefore the quick-acting compounds, such as sulphuric acid and tar acids, give much better control than the slower ones. As haulm-killing accentuates the 'setting' of the tuber skin if the kill is virtually complete, maximum resistance to lifting injury is obtained by leaving the crop in the ground as long as possible after spraying. Skin-'setting' was assessed by rubbing sharply the skin of washed and dried tubers

three times in succession with the ball of the thumb. Skin-breaking at the first rub was graded 0, at the second 1, at the third 2, and no break 3. The use of tar derivatives and other compounds had no deleterious effect on the cooking quality of the tubers or on the soil.

T.A.C. 36 c [*R.A.M.*, xxvi, p. 463] plus the emulsifier and T.A.C. 42 also with emulsifier gave equally good results in a restricted field trial and are regarded as satisfactory for commercial use, which must be restricted because of high prices. Comparative costs are given for the more effective compounds. It is concluded that certain tar-acid sprays are the most effective non-corrosive substitutes for sulphuric acid on vigorous haulms. For killing senescent haulms some of the less effective and cheaper compounds such as sodium chlorate or copper sulphate and salt may prove reasonably satisfactory in most years.

Berkeley (G. H.), Thompson (R. W.), & Richardson (J. K.). **Five county Potato spray and dust project.**—*Proc. Potato Sect. Ont. Crop Improvement Ass., 1947*, pp. 82–84, 1 fig., 1947.

The results of the 1945 potato spraying and dusting experiments at Strathroy have already been reported [*R.A.M.*, xxvi, p. 212]. In 1946 the experiment was located near Brantford and was enlarged to 200 plots consisting of 40 different treatments replicated five times, using 20 different fungicides with DDT included in all sprays and dusts. There was no blight [*Phytophthora infestans*], but the yield data show that dithane was again superior to Bordeaux, plots sprayed with Bordeaux and phygon giving the lowest yields.

Parks (D. L.). **A Potato dusting and spraying experiment in eastern Ontario.**—*Proc. Potato Sect. Ont. Crop Improvement Ass., 1947*, pp. 85–89, 3 figs. (1 on p. 84), 1947.

An experiment conducted during 1946 at the Kemptville Agricultural School to test the effect of various fungicides against both early [*Alternaria solani*] and late blight [*Phytophthora infestans*: see preceding abstract] of potatoes was undertaken with the co-operation of the Crops, Seeds, and Weeds Branch of the Ontario Department of Agriculture. *A. solani* first appeared about 23rd July after a week of rainy weather, but *P. infestans* was absent. Although most treatments gave effective control of *A. solani* it continued to spread. The four treatments giving the highest yields were fermate 1½–1–100, naugazate (zinc dimethyl dithiocarbamate) 1½–1–100, copper-lime dust 12–85–3, and zerlate 1½–1–100, used with DDT. The potato vines of the plots sprayed with the organic fungicides fermate, zerlate, naugazate, and dithane were undamaged by the frosts which killed more than 90 per cent. of the tops on the other plots in the field. The unfrozen plants remained green for an extra month. Copper-lime dust with DDT effectively controlled early blight throughout the season.

Higinbotham (N.). **Some trace element deficiencies in Rice.**—Abs. in *Proc. Ind. Acad. Sci.*, lv, p. 37, 1945. [Received September, 1947.]

Nutrient solution experiments with rice indicate that it may be added to the list of plants requiring boron, manganese, and copper. Boron deficiency symptoms are distinctive, though resembling those due to a shortage of calcium in the chlorotic spotting of the leaves as they emerge at the tip. The first sign of manganese deficiency is a chlorosis of the mid-vein leaf areas resulting in striation of the young foliage. Plants deprived of copper showed no characteristic symptoms, but their weight was reduced in comparison with the controls. Supplementary experiments with boron demonstrated its indispensability for normal grain production; its utilization in the plant was shown to be related to the calcium supply.

PLANT (W.). **Survey of mineral deficiencies on tillage land.**—*Nature, Lond.*, clx, 4062, p. 336, 1947.

By applying the visual diagnosis and tissue tests [*R.A.M.*, xxvi, p. 467] for determining the nutrient condition of crops statistics of practical value to the soil chemist and agriculturist have been obtained. Two seasonal surveys employing the first method were carried out in Herefordshire during 1945 and in Somerset during 1946, in each of which a random sample of farms was taken to represent two per cent. of all holdings of ten acres or more. From May to October each farm was visited two or three times, cereals, beans, potatoes, sugar beet, roots, and kale being inspected. It was found that nitrogen deficiency affected most crops, 18 per cent. of the acreage in Somerset and 10 per cent. in Herefordshire, especially where the level of husbandry was low. Phosphate deficiency (19 and 20 per cent., respectively) was particularly prevalent in the case of cereals; potash deficiency (1 per cent. in both counties) mainly confined to potatoes, also affected some mangolds, and calcium deficiency was found only in roots in Herefordshire and was negligible. Boron was the only trace element apparently lacking; sugar beet and mangolds in Herefordshire only were deficient.

SCHMIDT (CATHERINE M.), JAMESON (DOROTHY H.), & SPECHT (VIRGINIA G.). **Bibliography of literature on potash as a plant nutrient reviewed September 1940 through December 1940. (With Index.)**—82+xxv pp., American Potash Institute, Inc., Washington, D.C., 1947. [Mimeographed.]

This annotated bibliography of the literature of potash as a plant nutrient covers only works reviewed from September to December, 1940, inclusive. The 275 items are arranged in three sections, the first under crops alphabetically, the second under potash (application, availability, deficiency, etc.), and the third under soils (soil absorption, soil losses, soil supply, etc.), each section being arranged alphabetically according to the locality. An index is provided to authors, subjects, and titles.

HUGHES (C. G.). **The varietal revolution in the Ingham District.**—*Proc. Qd Soc. Sug. Cane Technol., 1947*, pp. 103–106, 1 graph, 1947.

During the past two years great prominence has been given to the performances of two new sugar-cane varieties, Trojan and Eros, in the Herbert River district round Ingham, North Queensland. Both canes were produced by the Colonial Sugar Refining Company in 1933. In 1944 Trojan gave 37 per cent. of the crop and Eros over 6 per cent. In 1945 the figures were 67 and 10 per cent., respectively, and in 1946, 74·7 and 16·7. The change of varieties was a direct result of gumming disease [*Xanthomonas vasculorum*: *R.A.M.*, xxvi, p. 262].

HUGHES (C. G.). **The symptoms of leaf scald disease in Sugar-Cane.**—*Proc. Qd Soc. Sug. Cane Technol., 1947*, pp. 115–118, 1947.

A description is given of the symptoms of sugar-cane leaf scald [*Xanthomonas albilineans*: *R.A.M.*, vi, p. 121; xxvi, p. 263] as seen in Queensland, covering both the chronic and acute forms. In North Queensland the disease is usually present on the wetter, richer soils, but Badila is comparatively resistant; S.J. 4 is more susceptible, but remains moderately clean since the affected stools usually die. The two new canes, Trojan and Q 44, are susceptible.

VOLP (P.). **The ineffectiveness of roguing leaf scald infected fields for use as a source of planting material.**—*Proc. Qd Soc. Sug. Cane Technol., 1947*, pp. 99–101, 1947.

In an attempt to rogue sugar-cane stools affected by leaf scald [*Xanthomonas albilineans*: see preceding abstract] from fields to be used as a source of planting material the author inspected chosen fields of Q 44 in the wettest parts of the

Mulgrave area of Queensland at least three times during growth. All stools showing signs of leaf scald were chopped down before the plant cutters commenced operations. Normal disinfection of the knives was carried out. Five sections in the wetter districts were rogued in May and two more in August, the selected blocks being those which, it was considered, would yield suitable planting material. In addition, two second ratoon blocks were selected from which affected stools had been rogued in previous years.

In the plant fields rogued the diseased stools destroyed ranged from 0 to 16, while in the two ratoon blocks 17 and 78 stools were destroyed.

Inspection of the planted fields one to two months after germination showed the presence of leaf scald in all the blocks planted from the rogued cane, though no symptoms had been visible at planting. The percentage of infected stools ranged from 0·01 to 2 in the fields planted from plant cane and from 2 to 6 in those planted from ratoon material. Infection subsequently increased.

The evidence suggests that the roguing of moderately susceptible varieties gives no assurance of clean stock when the varieties are infected and conditions favour growth. As a means of controlling leaf scald, roguing should be regarded only as a last resort in an attempt to keep infection in subsequent plantings within reasonable bounds. The periodical introduction of clean seed to an affected farm in a wet area at somewhat long intervals is also not a successful control measure, since considerable natural spread appears to occur at some stage of the plant's growth. The sole effective means of control appears to lie in the introduction of clean seed for every planting made on an infected farm, and in no circumstances should any cane from such a farm be used for planting.

De Charmoy (D. D'E.). **Une maladie nouvelle de la Canne à Sucre a l'Île de la Réunion. L'apoplexie (Cephalosporium sacchari Butl.).** [A new Sugar-Cane disease in Reunion. Apoplexy (*Cephalosporium sacchari* Butl.).]—*Agron. trop.*, ii, 7–8, pp. 369–374, 2 figs., 1947.

The sugar-cane disease caused by *Cephalosporium sacchari* [*R.A.M.*, xviii, p. 500; xxii, p. 153, *et passim*] has been reported from the island of Reunion. It is believed to have been present in the island for some years but has remained unnoticed owing to the absence of a susceptible plant host (until P.O.J. 2878 and P.O.J. 2961 were introduced) and the frequent occurrence of red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*: ibid., xxvi, pp. 214, 234], which masked the other disease. Seed of P.O.J. 2961 (Selanger seedling) was first planted in Reunion in 1935. During the following year there was an outbreak of what was believed to be red rot, and this continued to occur although the original stocks and their progeny had been destroyed. Eventually it was thought that the disease was caused by a strain of *P. tucumanensis* distinct from that causing the red rot. Numerous isolations yielded *Cephalosporium sacchari*.

Artificial inoculations showed that the varieties P.O.J. 2961 and P.O.J. 2878 were those most susceptible to the disease, called 'apoplexy'. The canes first develop oily spots, several infected areas often appearing in the same field. Both the spikes and stems wilt, the latter also showing a red internal discoloration as in the case of red rot. Apoplexy can be readily distinguished from this, however, by (*a*) the primary infection of the cuttings prior to planting, which causes the young plants to die soon after emergence, (*b*) the secondary or collar infection derived from the soil after planting and causing the death of some isolated stems of young canes aged six to eight months, and (*c*) the most serious of the three, an aerial infection causing the death of mature stems during the harvest. In Reunion death of cuttings and young plants occurs very rarely, but the dry rot of the collar and stems is frequently observed. The more resistant cane varieties are Uba Marot, Co-281 [ibid., xvi, p. 774], Co-419, and R-331, 334, and 337.

Wehmeyer (L. E.). **Studies on some fungi from north-western Wyoming. IV. Miscellaneous.**—*Mycologia*, xxxix, 4, pp. 463–478, 2 figs., 1947.

The present paper in this series [cf. *R.A.M.*, xxv, p. 421] lists chiefly Uredinales and Discomycetes found in north-western Wyoming. *Taphrina alpina* [ibid., xxvi, p. 60], is reported as causing a profusely branching witches' broom growth on birch (*Betula glandulosa*). It has thick-walled, hyaline ascogenous cells, 10 to 18 by 9 to 10 μ, forming a subepidermal network or occasionally rupturing the tissue. The asci are usually hypophyllous, 21 to 27 by 8·5 to 9·5 μ, and the ascospores globose, 3·5 to 5 μ in diameter. The more noteworthy rusts are *Coleosporium solidaginis* [ibid., xxv, p. 192] on *Aster* sp. and *Pinus contorta*, *Cumminsiella sanguinea* [ibid., xxvi, p. 469] on *Mahonia aquifolium*; *Melampsora albertensis* [ibid., xxvi, p. 187] on *Pseudotsuga mucronata* and aspen (*Populus tremuloides*); *Melampsorella cerastii* [ibid., xx, p. 387] on *Picea engelmanni* and *Abies lasiocarpa*; *Puccinia coronata* on *Shepherdia canadensis*; and among the Hymenomycetes, *Exobasidium vaccinii* [ibid., xxvi, p. 129; xxii, p. 489] on *Menziesia ferruginea* and *Vaccinium membranaceum*.

Ramakrishnan (T. S.) & Ramakrishnan (K.). **Additions to fungi of Madras—II and III.**—*Proc. Indian Acad. Sci.*, Sect. B, xxv, 6, pp. 178–187; xxvi, 1, pp. 7–12, 2 pl., 10 figs., 1947.

Included in this critically annotated list of additions to Madras fungi (part I of which appeared in *Proc. Indian Acad. Sci.*, Sect. B, xxv, 1, pp. 7–12, 1 pl., 5 figs., 1947) are *Entyloma dahliae* on *Dahlia variabilis*; *Septoria erythrinae* n.sp., producing small, angular, pale green spots on *Erythrina* leaves; and *S. thespesiae* n.sp., which forms on the foliage of *Thespesia populnea* [a common shade and fence tree] circular, amphigenous, isolated or confluent lesions, 4 to 15 mm. in diameter, blackish-brown with a grey centre on the upper surface and sepia-coloured on the lower.

Filiform, hyaline, straight or bent conidia of *E. dahliae* were borne on fasciculate conidiophores on the upper surface of the leaves, imparting a white, ropy, reticulate appearance to the surface. The black, subepidermal, globose, ostiolate pycnidia of *S. erythrinae* measure 150 by 90 μ and the cylindrical, straight, triseptate, hyaline, subsessile pycnidiospores 36 to 58 by 4 to 6 (average 44 by 4) μ. *S. thespesiae* is characterized by globose, innate pycnidia, 74 to 96 by 63 to 111 (88 by 93) μ, and cylindrical, straight, bi- to sexseptate, hyaline, subsessile pycnidiospores, 9 to 37 by 2 to 4 (28 by 4) μ.

Thirumalachar (M. J.). **Doenças causadas por fungos dos gêneros 'Elsinoë' e 'Sphaceloma' em Misore (sul da India).** [Diseases caused by fungi of the genera *Elsinoe* and *Sphaceloma* in Mysore (South India).]—*Arq. Inst. biol., S. Paulo*, xvii, 4, pp. 55–66, 8 figs., 1946. [English summary.]

The following species of *Elsinoe* and *Sphaceloma* on hosts of economic importance are described from Mysore with critical annotations: *S. oleanderi* on *oleander*, *S. terminaliae* [*R.A.M.*, xvii, p. 348] on *Terminalia bellerica*, *S. santali* on sandal, *S. spondiadis* [ibid., xxii, p. 179] on *Spondias mangifera* [*S. pinnata*], *Sphaceloma curcumae* on turmeric (*Curcuma* sp.), *E. fawcetti* on citrus [ibid., xxiii, p. 14], *S. punicae* on pomegranate [ibid., xxii, p. 180], and *S. fici* Thirumalachar n.sp. on *Ficus glomerata*.

S. oleanderi produces on oleander foliage irregular or circular, densely aggregated, slightly raised, whitish lesions with black margins, 1 to 4 mm. in diameter, which gradually extend over the whole surface, resulting in severe defoliation.

In conjunction with *Oidium* sp. and *Asterina congesta*, *S. santali* contributes to the premature defoliation of the sandal, a very valuable source of revenue in Mysore. The spots on the upper leaf surface are ashen-grey, sometimes with a

purplish-black tinge, and impart a dark to black appearance to the affected areas.

Spondias pinnata is of some economic importance, its unripe fruits being used in the pickling industry. The fructifications of the Mysore species of *Sphaceloma* attacking this host are considerably larger than those reported for *S. spondiadis* from Florida and Brazil, the acervuli of the former, for instance, measuring 150 to 250 μ in diameter as against 30 to 150 μ for the latter. However, in the absence of facilities for a comparative study the Indian fungus is provisionally referred to *S. spondiadis*.

S. punicae causes a severe disfigurement of pomegranate fruits in the form of purplish-black, pulvinate, confluent lesions tending to harden or rupture the peel. The fungus has been reported from Italy (as *Hadrotrichum populi*), Brazil, and Argentina, but the pomegranate is a native of Asia and investigations in the orchards of India, especially the north-east, might well yield valuable information as to the original habitat and geographical distribution of the pathogen.

S. fici produces on both surfaces of *F. glomerata* leaves circular or somewhat irregular spots, 2 to 4 mm. in diameter, with whitish, papery centres and greyish margins. The species is characterized by erumpent, intraepidermal, circular or elongated acervuli, 28 to 144 by 26 to 34 μ, and pale yellow conidiophores, up to 15 by 2·4 μ; conidia were not observed.

THIRUMALACHAR (M. J.). **Brief notes on the genera Stereostratum Magn. and Anthomycetella Syd.**—*Mycologia*, xxxix, 3, pp. 334–340, 7 figs., 1947.

From an examination of material of *Phyllostachys bambusoides* collected by Kiyoshi Aoki in Japan in 1933 and forming part of Sydow's Fungi exot. exs. No. 953 the author gives a description of the morphology of the bamboo rust, *Stereostratum corticioides*, of which only the uredo- and teleutospores are known, and a brief history of its nomenclature. As the teleutospores possess three germ pores and develop in succession from the base of the hymenium, the genus has been tentatively included in the Pucciniosirae.

CUNNINGHAM (G. H.). **Notes on classification of the Polyporaceae.**—*N.Z.J. Sci. Tech.*, A, xxviii, 4, pp. 238–251, 10 figs., 1946.

The delimitation of genera and species of the Polyporaceae may be implemented by the use of such microscopic features as hyphal systems, series, types, and colour, basidial types, and context inclusions.

The family comprises three hyphal systems, monomitic, dimitic, and trimitic. In the monomitic system the hyphae are of the generative series alone, long and ribbon-like, twisted and collapsed, or rarely closely interwoven, ranging from 3 to 16 μ in diameter, brown or hyaline, thin-walled, septate, and branched. They serve to form the hymenophore in the absence of skeletal or binding series. Clamp-connexions may or may not be present.

The hyphae of the dimitic system belong either to the skeletal or generative series, and may be brown or hyaline, with or without clamp-connexions, and of one or other general type 'bovista' or 'long'. 'Bovista' hyphal types, so called by reason of their resemblance to the capillitium of the genus *Bovista*, may be dissected out readily and are common to species with hyaline, floccose context, e.g., *Polyporus betulinus* and *P. sulphureus*. Each consists of a main stem 3 to 10 μ in diameter, producing several lateral branches, which in turn may be branched and tapered towards the ends. They occur in hyaline species with a dimitic, and in both hyaline and brown with a trimitic system. The 'long' type is composed of slender hyphae which may ramify in the context for several millimetres, either in a continuous parallel band or loosely interwoven. They range from 3 to 7 μ in diameter and may taper towards the ends; knotting or twisting sometimes occur.

The binding hyphae present in species with a trimitic system also fall into the 'bovista' and 'long' types, those of the former being freely branched, aseptate, and with a main stem 3 to 9 μ in diameter, and those of the latter sparsely or richly branched, 2 to 4 μ in diameter.

Three basidial types are described, namely, 'merulioid', 'honeycomb', and 'clavate'. Merulioid basidia are hyaline, long-cylindrical, 12 to 30 by 3 to 4 μ, persistent, and compacted into a gelatinous, firm layer, usually arising from a subhymenium of densely woven hyphae. The spores are usually cylindrical or allantoid, except in a few *Merulius* spp. Basidia and the subhymenial tissue are commonly separated from the tissues of the context, a feature common to *M.* spp.

Basidia of the honeycomb type are clavate or oval, 8 by 4 μ, stain readily, and are laterally cemented at the base into a palisade. When they finally collapse the cemeted basal layer persists on the tramal wall, presenting a honeycomb-surface aspect and occasionally showing perforations of the cut edges like those of a postage-stamp. The hyphae of all but three of the 32 species of this basidial type are brown.

The clavate type is the most common, the basidia (occasionally elongate-clavate or fusoid) varying in length from 6 to 25 μ and arising from a two- or three-layered subhymenium. They are not infrequently mixed with ends of skeletal hyphae, which may project beyond the hymenial layer into the pore cavity and have then been termed paraphyses or cystidia.

Clamp-connexions are present in all hyaline species with a monomitic system, in most hyaline species with a dimitic system, and in all species, whether hyaline or brown, with a trimitic system.

An outline is given of the microscopic features of the species (about 100) so far examined.

Heim (R.). **Sur les caractères des Polypores en culture artificielle.** [On the characters of the Polypores in artificial culture.]—*C.R. Acad. Sci., Paris*, ccxxv, 10, pp. 421–423, 1947.

Cultural characters have been found in the author's experiments, covering a ten-year period, to furnish important clues to the determination of various species of Polypores, notably of the genera *Ganoderma* and *Xanthrochrous*, which sometimes present considerable difficulties in this respect. On Sabouraud's medium, for instance, the cultures of *G. lucidum* are bi-coloured, endopigmented, radially furcate, heterogeneous, even cerebriform in diffuse light; of *G. applanatum* concentrically zonate, multi-coloured, endopigmented, heterogeneous; of *G. resinaceum* homogeneous, monochrome, with a diffusible exopigment and profuse exudate; and of *G. curtisii* perfectly homogeneous, without exudate or pigment. Other distinctive characters are brought into prominence by the use of various standard media, while particularly interesting results have been obtained on a substratum based on albumen from *Gleditsia triacanthos* seeds.

X. [*Polyporus*] *perennis* is the only one of the numerous species of this genus studied to produce non-pigmented cultures, confirming its exceptional status already indicated by the absence of spinules, the terricolous habitat, the peculiarity of the stipe, and the rapid seasonal growth. According to Bourdot and Galzin, *X. tamaricis* and *X. corruscans* are merely varieties of *X. rheades*, but on Sabouraud's medium the former produces chrome-yellow and the latter chocolate-brown colonies. On the other hand, *X. tamaricis*, which the above-mentioned authors distinguish from *X. ribis*, is culturally similar to the latter, though not identical. Finally, *X. versatilis* proved to be culturally indistinguishable from *X. corruscans*.

In the foregoing examples the cultural characters of the species have served to correct deductions based on observations of the fruit bodies in nature. In the case of *X.* [*Fomes*] *pini* and *X. abietis* (the agent of severe damage to firs [*Abies* spp.]

in the Swiss Juras), the morphological differences between the two species are corroborated by cultural divergences, the colonies of the latter, for instance, being more delicately filamentous and fainter in colouring than those of the former. The likenesses between the two species, however, point to a close mutual relationship and also to *X.* [*P.*] *cuticularis.* Absolutely identical cultures were produced by *Ungulina marginata* and *U.* [*F.*] *pinicola,* occurring on hardwoods and conifers, respectively, which confirms a suspicion already entertained as to the identity of the two forms.

Other observations deal with the close relationship between *Melanopus* [*P.*] *squamosus* and *P. forquignoni*, the two cultural forms of *Spongipellis* [*P.*] *spumeus*, and the independent status of *P. castaneae*.

HAHN (G. G.). **Analysis of Peck's types of Meliola balsamicola and Asterina nuda.**—*Mycologia,* xxxix, 4, pp. 479–490, 1 pl., 1 fig., 1947.

A recent study of Peck's two type specimens, *Meliola balsamicola* and *Asterina nuda*, on *Abies balsamea* revealed that they are distinct species of different genera. *M. balsamicola*, a rare fungus on green balsam fir needles, belongs to the Perisporiaceae (Phaeodidymae) and probably to the genus *Dimerium*. Further intensive study of the species is necessary. The preferred name for *Asterina nuda*, common on dead fir needles, is *Adelopus nudus* (Pk) Hoehn. *A. balsamicola* is considered a synonym [*R.A.M.*, xxv, p. 51]. The involved synonymy of this species is discussed and morphological data given for both species.

HAHN (G. G.). **A new combination for Brunchorstia gibbosa.**—*Mycologia,* xxxix, 4, pp. 494–495, 1947.

The species *Brunchorstia gibbosa* was erected by Wollenweber in 1931 [*R.A.M.*, x, p. 626] and has been reviewed recently by Ettlinger [ibid. xxv, p. 588]. In the present paper it is stated that Boyce, who collected the material originally from cankers of Douglas fir (*Pseudotsuga taxifolia*), sent some also to Dearness, who named it *Cryptosporium boycei* [ibid., viii, p. 66]. A consideration of this genus, however, shows that the fungus cannot be included in it, but that the correct name should be *B. boycei* n. comb. with the synonyms *B. gibbosa* and *C. boycei.*

Blister blight of Tea.—*Plant. Chron.*, xlii, 3, pp. 49–50, 1947.

The Tea Scientific Officer of the United Planters' Association of South India believes that the adjustment of the time of pruning will assume fundamental importance in blister blight [*Exobasidium vexans*] prevention and control [*R.A.M.*, xxvi, p. 358]. Under local conditions the succulent leaf and green shoots of newly pruned tea are most susceptible to infection, and it is here that the pathogen usually appears first on individual estates, gradually spreading to bushes pruned two, three, and four years ago. The new growth developing on tea within a few months of pruning is liable to complete destruction, and when the fungus eventually dies down and growth is once more resumed, tufts of small shoots may arise from a point round the branch where one shoot was attacked. It is imperative that as many bushes as possible should have been pruned long before the incidence of blight tends to reach a climax. With this object in view, the safest procedure would be to avoid all pruning between 15th February and 1st September at the earliest, thereby providing four clear months for the development of new growth while the disease is quiescent. In the case of an abnormally late monsoon the resumption of pruning may have to be postponed for another six weeks or two months.

Blister blight affects Ceylon Tea.—*Plant. Chron.*, xlii, 3, pp. 50–51, 1947.

Writing in *The Times of Ceylon Mail Edition*, C. H. GADD gives an outline of the distribution of blister blight [*Exobasidium vexans*] on tea [see next abstracts] in

Ceylon [*R.A.M.*, xxvi, p. 514], where it was first reported from Dolosbage on 25th October, 1946. The disease appears to be most prevalent on estates at an altitude of over 1,500 ft. above sea-level. Spraying operations on a sufficiently large scale for effective control are regarded as impracticable except in nurseries, and the plucking and destruction of infected leaves is therefore recommended as an alternative. Experiments have shown that about a fortnight elapses between the establishment of the spore and the formation of the blister on the leaf.

TUBBS (F. R.). **Blister blight.**—*Tea Quart.*, xix, 1, pp. 9–17, 1947.

This paper, read at the Seventh Conference of the Tea Research Institute, Ceylon, in February, 1947, deals with blister blight (*Exobasidium vexans*) of tea in Ceylon [see preceding and next abstracts]. The author stresses the importance of studying the behaviour of the disease in Ceylon rather than relying on the reports from India, where there may be differences in the behaviour of the fungus owing to dissimilar climatic conditions or other conflicting circumstances. As the incubation period of the disease is long it is likely that the isolated outbreaks reported subsequently to the first at Dolosbage [loc. cit.] were distinct from, and not a result of, the original outbreak. New outbreaks occurred with increasing frequency from November, 1946, until the beginning of January, 1947, when a decline set in. The range of elevation increased until it occurred above 6,500 and below 500 ft., the majority of reports coming from elevations of about 4,000 ft., where most large estates are found. It is noteworthy that it appeared in Uva during the period of the north-easterly winds.

Spraying of nursery bushes should be carried out once at the end of the dry weather and then, subject to experience, once a week during fair periods.

In the discussion which followed the paper late tipping was not recommended owing to the danger of much infectable material being left on the bush for a longer period, so encouraging rapid multiplication and spread of the disease. One of the most convenient sprays for protecting uninfected foliage is perenox at 1 oz. to $2\frac{1}{2}$ gals. water applied whenever new leaves are produced; this spraying, however, does not mitigate the effects of infections which have already occurred.

Recording the incidence of blister blight.—*Tea Quart.*, xix, 1, pp. 20–22, 1947.

This article is the substance of a circular issued by the Ceylon Tea Research Institute to estates in April, 1947. Blister blight of tea caused by *Exobasidium vexans* [see preceding abstracts] causes most damage in recently pruned fields, where the whole of the new growth may be destroyed, and least in fields in full plucking. Therefore the time of pruning may have to be adjusted in order that bushes may be in their most susceptible stage when the incidence of the fungus is likely to be least. It is suggested that estates should record observations of the relative susceptibility of the different fields during the year, indicating severity under one of the following headings by using the relevant numeral: 0, disease absent or difficult to find; 1, disease apparent as white blisters on leaves, blisters per bush not very numerous, some bushes unaffected; 2, white blisters numerous but stems unaffected; 3, many young stems somewhat damaged but not killed throughout their length; 4, young stems severely damaged, many completely destroyed. Normally two records per month, one at the middle and one at the end, should be sufficient but sometimes four may be necessary in young fields. Where fields are divided into areas the pruning dates for each area should be recorded separately and no area should be larger than can be pruned in a fortnight. Further advice is given regarding notes to be added, design of record sheet (a sketch of which is given), and methods of filing and recording.

Smith (T. E.). **Hereditary defects in the T.I. 448 A Tobacco and its hybrids.**—*Phytopathology*, xxxvii, 6, pp. 424–426, 1 fig., 1947.

During the development of flue-cured strains of tobacco resistant to bacterial wilt [*Xanthomonas solanacearum*] at the North Carolina Agricultural Experiment Station [*R.A.M.*, xxv, p. 189] a parasitic disease and two hereditary defects were observed on T.I. 448 A and its hybrids. The pathogen, *Olpidium brassicae* [ibid., xxv, p. 88], destroyed over 90 per cent. of the plants in the four- to six-leaf stage of one hybrid line in 20 sq. yds. of bed. The most prominent symptoms of the blight were chlorosis and withering accompanied by brownish root decay.

Another disease, characterized by stunting, brown root decay, and withering in hot weather, was suggestive both of the foregoing seedling blight and ammonia toxicity, but was shown to be due to neither cause. All single-plant selections of T.I. 448 A were susceptible, and healthy seedlings could not be grown in steam-sterilized soil either in outdoor beds or in the greenhouse. High soil temperatures mitigated the severity of the disorder, to which flue-cured varieties were uniformly resistant. The F_1 of such varieties crossed with T.I. 448 A made normal growth, indicating the dominance of resistance.

Among the F_2 population of 1,518 plants arising from crosses between T.I. 448 A and flue-cured varieties, 2·24 per cent. were affected by a leaf spot. Typical symptoms of the condition were white and brown necrotic lesions on the lamina, combined with brown cankers of the primary and secondary veins. Leaf-breaking of the larger cankers on the primary veins was also observed. The cause of the disturbance is unknown. Washed tissue from young lesions was sterile on potato dextrose agar and the leaf spot was not transmitted by grafts. Resistance appeared to be dominant in breeding tests. The secondary vein lesions resembled a 'physiological weakness' reported by J. Johnson (*Genetics*, iv, pp. 307–340, 1919) in Little Dutch Cuban hybrids.

Mills (W. R.). **Tomato race of late blight overwintering on Potato tubers in Pennsylvania.**—*Plant. Dis. Reptr*, xxxi, 6, p. 230, 1947. [Mimeographed.]

Potato tubers infected by blight (*Phytophthora infestans*) from nine Pennsylvanian counties were examined in order to determine whether the tomato strain of *P. infestans* [*R.A.M.*, xxvi, p. 428] overwinters on potato tubers and the relative occurrence of the potato and tomato strains. All isolates from counties which grow few tomatoes were of the potato race. Isolates from counties growing both tomatoes and potatoes were predominantly of the tomato race.

Allard (H. A.). **Early reports of destructive attacks of late blight on Tomatoes in England.**—*Plant Dis. Reptr*, xxxi, 6, p. 231, 1947. [Mimeographed.]

The severe epidemic of late blight (*Phytophthora infestans*) [*R.A.M.*, xxvi, p. 220, and preceding abstract] on tomatoes in the eastern United States in 1946, which resulted in an estimated loss of $40,000,000, induced the author to review reports of early outbreaks of the disease. According to various sources destructive attacks of tomato blight occurred in England in 1875 and 1878, in the latter year practically all outdoor tomatoes being killed. It appears that a heavy attack one year does not presage another the succeeding year, but incidence depends on seasonal conditions.

Waterman (Alma M.). **Rhizosphaera kalkhoffi associated with a needle cast of Picea pungens.**—*Phytopathology*, xxxvii, 7, pp. 507–511, 2 figs., 1947.

The discoloured needles of 25-year-old blue spruce (*Picea pungens*) trees undergoing severe defoliation in a 15-acre planting at Litchfield, Connecticut, in the spring of 1938 bore pycnidia of *Rhizosphaera kalkhoffi* [*R.A.M.*, xi, p. 136], not previously reported from the United States though recorded by Macrae and Con-

ners on the same host from Canada [ibid., xxi, p. 121 (recorded on p. 87)]. The needle cast has since been observed in New York State, Virginia, Maine, and Massachusetts. The pycnidia and spores agree with Bubák's type specimen and description (*Ber. dtsch. bot. Ges.*, xxxii, pp. 188–190, 1914). In pure culture on bacto malt extract medium the ovoid, unicellular, hyaline to brown-tinged pycnospores measure 7 to 9·8 by 4·4 to 6·6 μ, compared with 7 to 10 by 3 to 5 μ in nature.

The fungus appears to proceed from the lowest branches upwards, the first symptom of infection, usually observed in the late summer, being a yellow mottling of the mature needles of the current season's growth. In some of the discoloured areas small tufts of brown, thick-walled hyphae are found protruding from the stomata. Occasionally a few needles on the newly formed twigs turn purplish-brown, and in the spring the pycnidia develop above the stomata on all surfaces of the needles. The small, white, waxy mass normally occupying the stomatal aperture adheres to the top of the pycnidium until maturity. In severe outbreaks of *R. kalkhoffi* the infected needles are usually shed during their second summer, leaving only those of the current season's growth. The intact terminal buds continue to put out new growth each year, but the gradual weakening of the twigs through premature defoliation results in stunting of the fresh needles and their susceptibility to the pathogen. The progress of the needle cast is very slow and significant damage is largely confined to the basal branches, decreasing the ornamental value of the trees.

Satisfactory control of the disease in a group of selected trees in the Connecticut planting was effected by three applications at fortnightly intervals of 4–4–50 Bordeaux mixture plus casein, beginning in the latter part of June. During the two seasons covered by the experiments the progress of the needle cast was arrested by the treatment on trees with the lowest branches defoliated by the fungus, while neighbouring spruces with only slight infection were adequately protected from further spread of the disease.

HAHN (G. G.). **Berg's rust resistant Red Cedar susceptible to Phomopsis juniperovora in greenhouse tests.**—*Phytopathology*, xxxvii, 7, pp. 530–531, 1947.

Two red cedar (*Juniperus virginiana*) seedlings grown from clones reported by Berg to be highly resistant to cedar-apple rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xx, p. 98] were tested by the author at New Haven, Connecticut, in 1946, for their reaction to *Phomopsis juniperovora* [ibid., xxii, p. 481], the inoculations being performed in August by a method previously described [ibid., vi, p. 327]. Lateral branches, 3 to 4 mm. in diameter, inoculated near the trunk, died back to the main axis. When the inoculum was applied to the trunk (7 mm. in diameter at the point of incision) girdling ensued and the terminal was slowly killed. Within two months erumpent sporulating pycnidia developed round the sites of inoculation. Reisolations in early December of *P. juniperovora* from diseased inner bark tissue resulted in the production on malt extract agar of a yellow coloration and red crystals, two specific characters of the parasite first recognized in 1917 (*J. agric. Res.*, x, pp. 533–40, 1917) and since proved to be of great diagnostic value.

HATFIELD (W. C.). **Shoot blight of Aspen and Poplar caused by species of Fusicladium.**—Abs. in *Univ. Wyo. Publ.* (formerly *Univ. Wyo. Publ. Sci.*), xii, 1–4, pp. 73–74, 1946.

Three species of fungi are stated to be concerned in the etiology of aspen and poplar shoot blight, viz., *Fusicladium radiosum* [*Venturia populina*: *R.A.M.*, xix, p. 387], *F. elegans* (Servazzi) Solheim and Hatfield n. comb. (= *Pollaccia elegans* Servazzi) [loc. cit.], and *F. lageniformis* Solh. & Hatf. n.sp. Inoculation experiments with the two last-named showed that *Populus alba* var. *bolleana* was the

most susceptible of the species tested, followed in descending order by *P. tremuloides*, *P. nigra* var. *italica*, *P. angustifolia*, and *P. sargentii* (which was apparently immune from *F. elegans*).

In cultural studies of the same two pathogens the optimum growth temperature was 25° C. for *F. elegans* and 20° for *F. lageniformis*, the corresponding optima for spore germination being 15° and 20°, respectively. The addition to potato dextrose agar of autoclaved yeast and thiamin chloride resulted in enhanced density and luxuriance of growth and, in the case of *F. elegans*, in a recrudesence of sporulation. Both species utilized dextrose, lactose, levulose, mannose, and sucrose, singly or in combination, on non-nutrient agar: their growth was not affected by the addition to several media of asparagine and peptone.

Goidànich (G.). **Sulle cause dei cedimenti nella pavimentazione del Palazzo Corsini, dell' Accademia Nazionale dei Lincei.** [On the causes of subsidences in the flooring of the Corsini Palace, the seat of the National Academy of the Lincei.] —*R.C. Accad. Lincei*, Ser. VIII, i, 7–8, pp. 872–880, 4 figs., 1946.

Subsidences in the flooring of the Corsini Palace, an eighteenth-century building, have resulted from a deterioration in the supporting timber due to a form of dry rot caused by a wood-destroying Basidiomycete, probably *Merulius lacrymans*. It is thought that the timber was infected when originally laid down and that decay was favoured by damp and lack of aeration. Fungal activity probably ceased, however, at least a century ago; the vegetative organs of the causal organism and of the accompanying superficial microflora were unrecognizable microscopically, and could not be cultured. The pendulous mycelium consisted of hyphae 2·5 to 3 μ thick with septa 50 to 60 μ apart, with isolated intercalary swellings 5 to 7 μ in diameter, and of other, thin hyphae without visible septa. These hyphae were thickly coated with calcium oxalate. The mycelium of the rhizomorphs was more regular, measured 2 to 2·5 μ in diameter, and showed very little coating.

The author advises the replacement only of the timber no longer possessing the minimum mechanical resistance. Experiments showed that two strains of *Coniophora cerebella* [*C. puteana*] and *Polyporus vaporarius* [*Poria vaporaria*] grew readily on the unaffected parts of the wood, but failed to grow even under optimum environmental conditions on the infected part and that immediately beneath.

Rodigin (M. N.). Видовой состав домовых грибов в Башкирской АССР. [An account of house fungi in the Bashkir Autonomous Soviet Socialistic Republic.] *Trud. Bashkirsk. Selsk. Xozd.* [*Bull. Bashkir agric. Inst.*], v, 2, pp. 35–37, 1946.

In 1939 the damage caused to wooden buildings in Bashkir (especially in Ufa) assumed alarming proportions and the Phytopathological and Entomological Agricultural Institute in Bashkir examined many of the buildings and made numerous wood analyses. From 1939 to 1944 the following wood-attacking fungi were identified: *Merulius lacrymans* (widespread) [*R.A.M.*, xxvi, p. 370], *Poria vaporaria* (very common) [loc. cit.], *Coniophora cerebella* [*C. puteana*: loc. cit.], *P. vaillantii* [ibid., xxv, p. 20], *Paxillus acheruntius*, *Peniophora gigantea*, *Lenzites sepiaria* [loc. cit.], *Corticium seriale*, *Trametes* [*Fomes*] *pini*, and *Ceratostomella pilifera*.

Davidson (R. W.), Lombard (Frances F.), & Hirt (R. R.). **Fungi causing decay in wooden boats.**—*Mycologia*, xxxix, 3, pp. 313–327, 4 figs., 1947.

In this survey of decay in boats [cf. *R.A.M.*, xxiv, p. 346] wood-rotting fungi were obtained only from about one-third of the samples from which isolations were attempted. This was due either to the fungus being inactive in the selected wood, or to the fact that other moulds had invaded the decayed wood so completely that it was impossible to isolate the causal fungus. In some samples the fungus obtained

may not have been the cause of the principal damage but in general those most frequently recovered are believed to be among the more important species causing decay. An important new oak-rotting fungus [ibid., xxii, p. 333], *Poria oleracea* n.sp., which causes a brown rot in oak heartwood is described as developing light buff to tawny pores 1 to 4 mm. long in patches 3 to 6 mm. across before shrinking; basidia 9 to 13 by 4 to 6 μ; hyaline basidiospores 5 to 7 by 2 to 3 μ, somewhat pointed at the ends; and broadly ovoid, smooth-walled, abundant, hyaline chlamydospores, 5 to 10 by 3 to 6 μ. The type sporophores developed on white oak wood in flasks from cultures isolated from rot in oak. In 14 days a cottony fungus mat 7 to 8·5 cm. in diameter is formed, the optimum growth temperature being approximately 30° C.

Other species important in causing hardwood decay were *Daedalea quercina* and *Stereum frustulosum* [*S. frustulatum*]. Those causing softwood decay were, in descending order of frequency, *P. microspora*, *P. xantha*, *P. carbonica*, and *Lenzites sepiaria*.

Foster (A. A.). **Acceleration and retardation of germination of some vegetable seeds resulting from treatment with copper fungicides.**—*Phytopathology*, xxxvii, 6, pp. 390–398, 1 graph, 1947.

At the Central Florida Experiment Station, Sanford, Detroit Dark Red beet, Glory of Enkhuisen cabbage, Arlington White Spine cucumber, Black Beauty eggplant, Telephone pea, California Wonder [chilli] pepper, and Bloomsdale spinach seeds were germinated in Petri dishes, steamed soil, and soil inoculated with *Pythium*, *Corticium*, and *Fusarium* spp. after seed treatment with copper sulphate (one hour's immersion in a 1·5 per cent. solution at room temperature) or cuprous oxide (ten minutes' revolution in Erlenmeyer flasks containing dosages of 0·38 per cent. for cucumber and peas, 0·75 per cent. for cabbage, eggplant, chilli, and spinach, and 1·13 per cent. for beet).

The germination of cabbage, cucumber, and peas was reduced or delayed by the treatments [*R.A.M.*, xvi, p. 307; xvii, p. 219; xxvi, p. 459 *et passim*], whereas that of beet, eggplant, chilli, and spinach was increased or accelerated. Nitroprusside tests showed that the three kinds of seeds in the copper-sensitive class contain sulphydryl groups which are absent from those of the tolerant sorts. Copper sulphate and cuprous oxide were found to penetrate pea and cucumber seeds and destroy those sulphydryl groups. Moistening with 10 ml. of a 0·1 per cent. aqueous solution of cysteine hydrochloride partially restored the germinative capacity of pea seeds injured by copper sulphate. Cuprous oxide damage to pea seeds was expressed by a decrease in the dry and fresh weights of embryos from seeds germinated in Petri dishes, and in a reduction in respiration of peas but not in spinach.

In fungus-infested soil the injurious effects of the chemicals may be masked, the treated seeds showing much higher germination than the untreated where these damp off badly. For example, with cucumber seed copper treatments appeared beneficial, whereas peas benefited only with cuprous oxide, and non-treated cabbage seed germinated better than treated. In the presence of high concentrations of active pathogens with plants that are liable to damping-off the grower can afford to ignore the injurious effects of chemicals.

Meuli (L. J.), Thiegs (B. J.), & Lynn (G. E.). **The zinc salt of 2, 4, 5-trichlorophenol as a seed fungicide.**—*Phytopathology*, xxxvii, 7, pp. 474–480, 1947.

The zinc salt of 2, 4, 5-trichlorophenol proved superior to the other phenol derivatives tested at the Dow Chemical Company, Midland, Michigan, for the control of pre-emergence mortality of pea, Lima bean [*Phaseolus lunatus*], groundnut, and lettuce seedlings caused by such soil-inhabiting pathogens as *Rhizoctonia* [*Corticium*] *solani*, *Pythium*, and *Fusarium* spp. It was also effective in the reduction

of cotton seedling infection by *Glomerella gossypii* when applied to naturally contaminated seed before planting. Dosage rates have been established only for a few species of seeds, but the usual recommendation of 2 to 4 gm. per kg. for large seeds like cotton would in all probability be generally applicable. The zinc salt of 2, 4, 5-trichlorophenol should be used at a concentration of 30 to 50 per cent. and combined with an inert diluent.

Foster (H. H.). **Comparison of benzene vapour with certain sprays in the control of downy mildew of Cauliflower.**—*Phytopathology*, xxxvii, 6, pp. 428–431, 1947.

Experiments having demonstrated the efficacy of benzene vapour in the control of cabbage downy mildew (*Peronospora parasitica*) in Mississippi [*R.A.M.*, xxiv, p. 259], the fumigant was tested on cauliflower suffering from the same disease [ibid., xxiii, p. 247]. The results, however, were unsatisfactory, the treatment (45 applications between 8th November, 1945, and 11th January, 1946, at 50 c.c. per sq. yd.) being not only ineffectual against the pathogen but actively toxic to the plants, which were severely stunted and frequently killed in the early seedling stage. The best control in this series of tests was given by wettable spergon (4 lb. plus ½ lb. orvus per 100 gals.) applied bi-weekly between 9th November and 31st December, 1945. The plants had a disease rating of 1, representing vigorous growth with a mere trace of infection or slight necrosis on one or two lower true leaves, and an average weight per 100 plant tops of 765 gm. The disease rating for Dow seed protectant No. 5 (2 lb. plus ½ lb. orvus per 100 gals., bi-weekly) was 1·5 (fairly robust growth, a few necrotic lesions on the lower true leaves with some chlorosis and occasional defoliation), and for the unsprayed 3, expressing mediocre growth, with more or less stunting and usually some destruction in the early seedling stage, general foliar necrosis, often accompanied by a varying degree of stem discoloration; the corresponding average 100-plant weights were 442 and 403, respectively. For benzene vapour the disease rating was 4, connoting marked stunting, usually considerable loss of seedlings, extensive foliar necrosis, and shedding of the lower leaves; the plants are commonly weak, with discoloured stems, the latter and the roots often invaded by secondary rot-producing organisms. The average 100-plant weight in the plots receiving this treatment was only 99 gm.

Gordienko (F. I.). Природа и пути инфекции главнейших бактериозов Капусты и обоснование способов борьбы с ними. [Nature and methods of infection of the principal bacterioses of Cabbage and measures for their control.]—52 pp., 8 figs., Ukraine agric. Exp. Sta., Kharkov, 1940. [Received January, 1947.]

This study deals with the two principal bacterioses of cabbage in the U.S.S.R. In Ukraine and the northern and western parts of the country the greatest damage is attributed to black rot caused by *Bacterium campestre* [*Xanthomonas campestris*: *R.A.M.*, xx, p. 331], the physiological properties of which are described.

A new bacterial disease called by the author slimy bacteriosis (*Bacterium* sp.) was discovered actively spreading in a hot-bed in the winter of 1934 in the Kharkov district on cabbages at the heading stage. The extremely virulent bacteria destroyed the intercellular substances and in some cases were found in the cells. They showed Gram-negative reaction and when grown in pure culture on peptone agar they formed shallow, round, dirty white colonies with smooth, slimy surfaces and even edges.

Inoculation tests resulted in 50 to 100 per cent. infection of early, medium, and late cabbage varieties. Undamaged plants were also infected up to 100 per cent. Some of the characters were identical with those of *Bacterium carotovorum* [*Erwinia carotovora*].

In the seed-bed stage oily spots appear on the leaves which rapidly spread over the whole surface; the plants wilt and eventually die. During the heading phase

the infection appears on the margins of young leaves. The lamina often becomes puckered and sometimes breaks. The diseased parts wilt, and become thin, brown, and transparent. When young leaves are attacked the plants have a rosetted appearance. In unfavourable conditions for the development of the bacteria the disease does not progress in the leaves but remains at the stage of a marginal necrosis. In such cases the cabbage can develop a normal head and if the disease is not too severe the infected plants can give a yield. In 1937 on a State farm in the Kharkov district 100 per cent. destruction occurred in 44 ha. Both bacterioses can kill 90 to 100 per cent. of plants at an early stage. Potassium and mineral fertilizers in combination with manure applied on different soils reduce both bacterioses. Out of 12 cabbage varieties examined none was found to be fully resistant to both diseases. The late variety Zabadovka was the most resistant to black rot. The control measures recommended are: disinfection of the hot-bed frames and soil, seed treatment with mercuric chloride, crop rotation, use of mineral fertilizers, and the destruction of vermin, litter, and all crop remains. The effectiveness of these measures minutely followed was proved on a State farm where infection was only 0·9 per cent. and the yield 225 quintals [1 quintal = 100 kg.]. Further studies are recommended, especially to secure resistant varieties.

ROSE (A. S.). **Nicotine against the yellows virus of Sugar Beets.**—*Brit. Sug. Beet Rev.*, xv, 2, pp. 66–68, 1946. [Abs. in *Sugar*, xlii, 9, p. 51, 1947.]

Six uniform beet plots were artificially populated by green aphids [? *Myzus persicae*: *R.A.M.*, xxv, p. 532] that had previously fed on beets infected by the beet yellows virus [ibid., xxvi, p. 520], a similar uninfested group serving as controls. Forty hours later 3 per cent. nicotine dust was applied to all the plants at the rate of 40 lb. per acre, and two further treatments were given during the following ten days, thereby preventing the spread of the virus from the diseased to the healthy beets. Three weeks after infestation all the beets in the aphid-populated plots showed foliar yellows. The average total weights of the roots in the healthy and diseased groups of plots were 130 and 83 lb., respectively, and the corresponding sugar content 14·6 and 13·8 per cent., respectively. The calculated beet yields per acre from the uninfested and infested beets were 12½ and 8 tons, respectively.

COONS (G. H.), STEWART (D.), DEMING (G. W.), GASKILL (J. O.), HENDERSON (R. W.), LILL (J. G.), & NUCKOLS (S. B.). **Report on tests in 1945 of U.S. 215×216 and other varieties from Sugar Beet leaf-spot-resistance breeding investigations of the U.S. Department of Agriculture.**—*Proc. Amer. Soc. Sug. Beet Technol., 1946*, pp. 206–209, 1947.

During 1945, agronomic evaluation tests were carried out in 13 localities (four in Colorado, one each in Wyoming, Montana, Nebraska, Iowa, Minnesota, and Ohio, and three in Michigan) with the first and third releases of U.S. 215×216 and other sugar beet varieties obtained in the federal leaf spot (*Cercospora beticola*) resistance project [cf. *R.A.M.*, xxv, p. 101]. As the disease caused only minor damage, the comparisons made related mainly to the agronomic characters of the varieties, leaf spot resistance being a relatively slight factor.

The three releases of U.S. 215×216 form valuable additions to American sugar beet varieties. The third (made in 1945), tested as S.P. 4–7–00, and designated U.S. 215×216/3 is definitely a sugar type. All three are highly resistant to leaf spot, particularly the third, which is recommended for and will be allocated to all areas where leaf spot is severe. Its ability to produce a high sucrose content even under conditions of leaf spot exposure may prove very important. U.S. 215×216/1 or /2 will probably continue to be utilized as the all-round leaf spot resistant types, high in root yield and moderate in sucrose. The evidence obtained suggests that more

emphasis should be laid on breeding for specific adaptation, including disease resistance, and combining these factors with those affecting productiveness.

MURPHY (A. M.). **Sugar Beet and curly top history in southern Idaho 1912–1945.**—*Proc. Amer. Soc. Sug. Beet Technol., 1946*, pp. 408–412, 1 fig., 1 graph, 1947.

The rapid expansion of sugar beet production in southern Idaho in 1912 was abruptly checked in 1919 by the first very severe outbreak of curly top [*R.A.M.*, xxvi, p. 370]. The yearly acreages and yields from 1912 to 1945 are tabulated and show that the leafhopper [*Eutettix tenellus*] invasion forecasts by the United States Department of Agriculture Entomology Bureau were generally beneficial in encouraging or discouraging planting. Control by planting resistant varieties began in 1935, after which good yields were obtained every year. When U.S. 22 [ibid., xxiii, p. 284] came into general use, the entire acreage of southern Idaho was planted with it in 1942. In that year it gave a yield of 16·84 tons per acre.

OWEN (F. V.), MURPHY (A. M.), & RYSER (G. K.). **Inbred lines from curly-top-resistant varieties of Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1946*, pp. 246–252, 2 figs., 1947.

While much has already been achieved by mass selection in the development of sugar beet varieties resistant to curly top [see preceding abstract], improved methods have become imperative. This paper records the results of inbreeding experiments with a self-fertile curly top resistant variety. A 12 per cent. advantage in sugar production per acre over present commercial varieties was obtained with the hybrid S.L. 4108 (from S.L. 1–121 as ovule parent and the self-fertile CT9 as pollen parent). Not merely has the use of inbred lines proved feasible to secure resistance to curly top, but also resistance to minor diseases and to bolting. The very high degree of curly top resistance now available in the S_3 generation of CT9 makes it possible to consider using it or its male-sterile equivalent in crosses with varieties not resistant to curly top, if increased vigour or greater sugar content can be obtained in such hybrids.

BENNETT (C. W.). **Foreign virus diseases potentially dangerous to the Sugar Beet industry in the United States.**—*Proc. Amer. Soc. Sug. Beet Technol., 1946*, pp. 394–404, 1 fig., 1947.

Descriptions are given of the symptoms, host range, varietal susceptibility, and transmission of three serious virus diseases of sugar beet not yet reported from the United States, viz., yellows [*R.A.M.*, xxvi, p. 277], found in Europe, Argentine curly top [ibid., xxv, p. 245], and yellow wilt [ibid., xxv, p. 532] found in Argentina. The dangers ensuing from the introduction of these diseases are discussed.

Notice of lifting of the domestic Dutch Elm disease quarantine.—*B.E.P.Q., S.R.A., U.S. Dep. Agric.*, 2 pp., 1947.

Owing to the inadequacy of the Federal quarantine measures in controlling the spread of the Dutch elm disease [*Ceratostomella ulmi*] by its principal carrier the bark beetle [*Scolytus multistriatus*], Notice of Quarantine No. 71 is revoked as from 1st May, 1947.

The quarantine measures were rendered useless owing to the extensive flying powers of these insects, the distribution of which is known to be much wider than was thought when the quarantine was last revised [*R.A.M.*, xxii, p. 112]. The transportation of elm logs and firewood, which provide a ready source of infection, is largely local and the limited long-distance transit can best be controlled by the action of individual States. Nursery stock is not a potential source of infection as carrier either of the disease or the bark beetle. The possibilities of controlling short-distance spread by artificial means were reduced by the discontinuation of the rigid control measures in some areas where the disease was well established.